

THE

PHOTO



Marshall Cavendish

THE All about PHOTO

Each week, The Photo brings you an exciting range of articles that look at both the technical and creative aspects of photography

Improve your technique



A J Deane/Bruce Coleman

There's more to photography than simply pressing the button. What do you focus on? What kind of film should you use? What's the best way to use flash? How do you set up your living room to turn it into a studio? And how do they manage to photograph a butterfly in close-up without scaring it away?

We show you how to master the problems of using your equipment, and how to get the most out of your photographic skills. Also included—using filters, choosing the right lens for the subject, and how to use a home movie camera.

Assignment



John Sims

Each picture is an assignment in its own right. While the professional has almost unlimited resources to guarantee the perfect picture, the amateur has to make every shot count. Many everyday pictures or assignments pose a host of problems.

Each Assignment takes a detailed look at a specific picture-taking session.

Subjects range from a safari park to a window display. There's advice on photographing the family car—and shooting the managing director!

World of photography



Michael Boys

Every so often the amateur wonders what it's like to be a professional photographer, or how they get those amazing photographs taken at high speed. What happens on a glamour session with a top photographer? What tricks of the trade do they use?

We survey the whole world of photography, from exotic location shots to the wonders of scientific and specialist photography. Coming up—airial photography secrets; how they X-ray mummies; the work of top picture agencies such as Magnum; special effects on such films as *Star Wars*; interviews with some of the world's leading photographers, and examples of their work.

Equipment file



Jon Boucher

Choosing the right equipment can be a nightmare. There is so much conflicting advice, and the unwary beginner often feels lost in a jungle of technical specification and claims made by advertisers.

We do not test individual pieces of equipment. Instead, we show how to make up your

own mind about the equipment that you need for your own brand of photography, rather than buying for buying's sake.

As well as cameras and lenses we'll be looking at films, filters, flash and lighting equipment, enlargers and darkroom materials, and ways of testing equipment yourself.

What type of camera?

To many a beginner, photography is a world of technicalities and mumbo-jumbo. 'I just want a camera that I can point and shoot' is a common feeling among those buying for the first time.

So what do such basic terms as 'SLR' and 'manual override' mean? Are there hidden catches? And is it better to learn using a 'point and shoot' camera, or using one which has more complexity? Many of the features in The Photo apply to all cameras, inclu-

ding the very simplest. But there comes a point where 'point and shoot' cameras cannot take pictures because of their limitations, while the more versatile—and maybe cheaper—camera keeps on shooting.

Types of camera

Cameras are often described by the film format they use. So the simple snapshot cameras, with cartridge loading, can be called 110 or 126 ('Instamatic' type) cameras. For



Jon Boucher

35 mm cameras Both compact and SLR take the same film

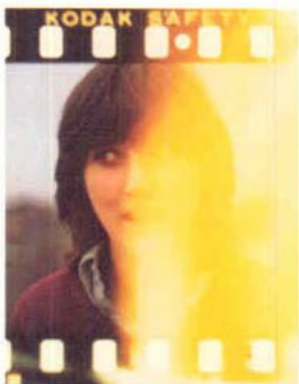
serious photography, most of these cameras have severe limitations.

Almost universally used by both amateur and professional photographers are cameras which take 35 mm

film. This comes in cassettes rather than cartridges, and requires a little more skill when loading.

There are two basic types of 35 mm camera—the viewfinder and the SLR. Viewfinder cameras are usually cheaper, and have separate viewfinder windows on the

What went wrong?



It is expensive to learn from your mistakes. But unless you have guidance on how to recognize and correct them you may not even know what's going wrong.

This feature looks at a specific mistake each week. It may be a handling error, such as unloading the camera wrongly, or it may be a fault with the equipment itself—in which case we show how to decide where the fault lies and how to go about getting it cured. Knowing this may save you unnecessary repair bills.

Creative approach

Herve Gloaguen/Viva



The way you approach any photograph depends very much on its subject—and for every subject there's a special way of bringing out the most it has to offer. We look at the wide range of subjects available to your lens and show how different photographers have treated them. They include nudes, flowers, night shots, candid photography, pets, patterns,

seasonal shots, water, machines, stars, sports . . . in fact, just about every topic you can think of. The emphasis will be on actually getting out and taking the pictures and finding an exciting, new, creative approach in each case.

The illustrations include shots taken by top photographers, many of whom have helped in the preparation of the articles.

front as well as the lens. They are often called *compact* cameras, as they are generally light and easily carried. Throughout *The Photo* you will find hints that will apply particularly to users of these compact cameras.

SLR cameras are more versatile, but are more bulky. SLR means 'single lens reflex'—you view the scene through the lens by a reflex mirror system. This means that you can change the lens for another one—such as a wide angle or telephoto—and see exactly what the final picture will show. It is best to use an SLR camera, but you can still



Quick focus An SLR is ideal for spur-of-the-moment shots

Understanding...

Cameras these days make photography a simple matter. But every so often you are confronted with some technicality that floors you. So we explain the technical side of the subject in language that everyone can understand.

Each subject is chosen for its relevance to practical photography. Once you understand how something works, it is easier to make it help you rather than hinder you.

Among the subjects covered are shutters (including the problems of flash synchronization), film contrast, reciprocity failure, how print and film emulsions work, the intricacies



Ed Baxter

of colour temperature, and what goes on inside your camera before, during and after exposure. Each is explained using specially commissioned diagrams and photographs which relate the subject to its practical use.

Darkroom



Darkroom work has never been easier. New methods and materials have brought home developing and printing within everyone's reach—and budget. Even colour work is easy once you know how, and it opens up a new world of exciting possibilities that are still being explored.

For example, making high quality colour prints from your own slides is becoming very popular. The results can be better than professionally produced ones—and you can create new images from your original material.

As well as enhancing the appearance of your home, the prints can be useful as gifts. You can also produce your own Christmas and greeting cards, particularly with the help of such materials as lith film. You may even be able to use your new-found skills to earn money, by selling prints or by taking news pictures for the local paper.

take good pictures with a compact viewfinder camera. To get the most out of photography, though, an SLR camera is indispensable, as it offers great versatility. If you are building up your photographic equipment, *The Photo* will help put you one step ahead of the salesman.

Automatic cameras

Almost all good cameras these days have a built-in light meter, to help get the exposure exactly right. An automatic camera adjusts the exposure automatically, but may give you no control over the shot. With manual over-

ride, you can decide to give a different exposure from the meter's choice—especially useful when taking pictures against the light, for example. In this issue of *The Photo* we show how to take these unusual and exciting photos, using this facility.

While it is possible to take great photographs with a 'point and shoot' camera, the technicalities do have their value. But we believe that while a good camera helps you take a good photograph, it is the person holding it that takes the picture. So whatever camera you have, get the most from it with *The Photo*!



Improve your technique

Choosing the shutter speed

Knowing what shutter speed will give the right effect for each picture is a valuable skill. The camera's speeds can also be put to creative use



Malcolm Robertson

Probably more shots are ruined by using a wrong shutter speed than by anything else. Whether you own a simple instant-load camera or an expensive automatic, your pictures can easily be spoiled by movement of either the subject or the camera.

Whatever type of shutter your camera has, its job is simply to open and close briefly to let light on to the film for a precisely known length of time. This interval—usually known as the exposure time or simply the shutter speed—is a tiny fraction of a second.

Newcomers to photography often find it hard to believe that anything at all can happen within, say, 1/125 second; but happen it can, for if the subject or the camera moves during this fraction of a second, the image may register on the film as a blur.

If the blurring has been caused by camera movement (usually called camera shake), it will be noticeable all over the photograph. No part of the picture—neither subject nor background—will be sharp. If the blurring has been caused by only the subject moving, the background, or at any rate some other part of the picture, will be sharp while the subject will be blurred.

Camera shake is cured either by putting the camera on some suitable support, or by using a fast enough shutter speed. Subject movement can

Camera shake

Two hand-held shots of the same subject. One, taken at 1/15, failed to eliminate camera shake. The other, at 1/125, is perfectly sharp

Porch Though

hand-held at 1/30, this view taken using a wide-angle lens is acceptably sharp. Any blurring caused by camera shake is not visible on the small scale image



Church close-up

A telephoto view from the same spot as the picture above, again using 1/30. It shows noticeable blurring as the increased focal length tends to magnify any camera shake. A speed of 1/125, or preferably 1/250, is needed



be cured only by using a sufficiently fast shutter speed.

Put like that, it sounds easy; but of course there is an in-built snag to using fast shutter speeds—the exposure time is shortened and therefore a wider lens aperture must be used to achieve correct exposure. This may or may not be a problem, depending on how much light there is and how much depth of field you need for the picture (a wide aperture gives least depth of field). For this reason it is useful to know what minimum shutter speed is needed to freeze different types of action.

To be absolutely certain of eliminating shake when you are hand-holding your camera, you should use a shutter speed not slower than 1/125 second when using the standard lens. This is the 'safe' speed; with practice, most people can successfully hand-hold a camera perfectly steady at 1/60, even 1/30 or 1/15.

You also need to take into account the conditions in which you are taking photographs—it is surprising just how much unsteadiness is caused by strong wind. Not so surprising is that being on a boat or in a car or aeroplane inevitably causes camera shake. So if you are in doubt about hand-holding the camera, use 1/125 or faster to be sure.

One catch—if you are hand-holding a long focus (telephoto) lens its magnification will exaggerate camera shake. This means using a faster-than-normal shutter speed, and for 35 mm camera users there is a useful rule of thumb for calculating this—you simply match the speed to the focal length of the lens being



Chusak Voraphitak



A still subject Photography indoors without extra lighting often calls for the use of slow shutter speeds—in this case $1/30$ —as long as the subject is not moving

used. With a 1000 mm lens, you need $1/1000$ second; with a 200 mm lens, $1/200$ (or $1/250$) will do. This rule gives about $1/60$ second as the slowest speed for the camera's standard lens.

The reverse is also true—wide angle lenses are much easier to hand-hold, so if you are forced by poor light conditions to use a slow shutter speed, a short focus lens is more likely to give you a sharp result.

Holding the camera steady

In theory, supporting a camera on a suitably robust tripod or stand completely eliminates camera shake, freeing you to use whatever shutter speed you wish. Obviously for long exposures, close-up or studio work, a tripod is vital, but many photographers do not realize that it is in any case a good idea to support the camera whenever possible.

If you are at all worried that you cannot hand-hold, make use of doors, fences, walls, posts—in fact, whatever is to hand—as a support for your camera. Stand with your feet apart but do not tense yourself. Squeeze the shutter gently rather than jab at it. According to your own preference, release the shutter while holding your breath, or just after exhaling. This can make a noticeable improvement in the sharpness of your pictures.

With a reasonable range of shutter speeds—this is generally taken to mean speeds of up to $1/500$ or $1/1000$ —freezing subject action presents few problems. But a more restricted range of speeds—or lack of light on a particular day—does not prevent you photographing moving objects, though you must be aware of problem subjects.

Frozen diver If the shot is timed to coincide with the peak of action, even fast movement can be stopped using a shutter speed of $1/250$

Daniel Barbier/Atlas Photo



M. Edwards/Daily Telegraph

Can you choose your shutter speed?

The very simplest and cheapest cameras have only one shutter speed—generally around $1/90$ second. This is adequate for general photography, and usually prevents blur due to camera shake. Rapidly moving objects, however, will be blurred; so your photography is restricted by such a camera.

An increasing number of modern automatic cameras give you no indication of your shutter speed, but instead just warn you by means of a light in the viewfinder when the shutter speed will be less than, say, $1/30$ second. You can control the shutter speed by varying the camera's aperture so that the auto-control will be forced to change the shutter speed accordingly to give a good exposure. But you will not be certain of the speed chosen, so for good results auto exposure can be a drawback.

Daniel Barbier/Atlas Photo



Fireworks A time exposure on 'B' of several seconds is sufficient to record several firework bursts. The time depends on the film and lens aperture

How to choose

When working out the right choice of shutter speed, a useful first step is to ask yourself what sort of movement you are shooting. If it is a normal movement, such as walking, you can work in the region of 1/125 provided the action does not take place too close to the camera, or directly across the field of view. With violent action—a hurdler, a child on a seesaw, a pole vaulter or a motor cycle scrambler—the slowest you can work at is 1/250 second.

Many modern cameras have a range of shutter speeds that goes up to 1/1000, and sometimes 1/2000 second, but for certain types of action, such as a nearby car, or a skier hurtling across the frame, even these will not freeze it absolutely.

There is no need, however, to put the camera away when faced with this type of situation. Much of the point of taking action photographs is, after all, to convey the feeling, the visual impression, of action—and in this, a little blurring is a positive help. The secret here is to use the technique known as *panning*: following the subject's movement within the viewfinder and releasing the shutter while continuing to swing the camera so it tracks the subject movement—even after taking the shot.

Done properly, this results in a sharp, or almost sharp, subject against a blurred background. Only those parts of the image which move smoothly will register

A. Fatras/Atlas Photo



Statue and flag

Although the main part of the subject will not move, a very rapid 1/500 is necessary to halt all movement of a thrashing flag

Frozen spray To 'freeze' movement such as the spray in this shot, use the fastest speed of your camera, at least 1/1000. Any less may give blur

The first thing to bear in mind about subject movement is that it only matters when it results in movement across the film. This means that if a car is coming straight towards you at 50 km/h, to a camera it will appear as if it is hardly moving at all, and will register sharply on film if you only use 1/60. If, however, it is moving across the camera's field of view, then its speed will be only too apparent. To be certain of freezing it, you will need to use 1/500 or 1/1000.

But if the same car moving across your field of view were 100 metres away, rather than 5 metres away, its movement would be much less apparent, and you could safely use a slower speed.

Finally, if the same car were coming towards you diagonally, its movement would be less apparent than when moving straight across. In this case you would probably freeze the action at 1/250 even if the car was close.

As before, long focus lenses exaggerate the effects of movement, while short focus lenses reduce them. There are formulae for working out the appropriate shutter speed for all subjects with various lenses, but they are not usually to hand when you are faced with a particular problem. The only way to be sure of good results is to use common sense and experience—after a while you will be able to do this automatically.

Paolo Koch/Vision International



Snow buggy You can use relatively slow speeds if a fast-moving object is coming towards the camera—1/60 was sufficient in this shot

Racing car By using the technique of panning, moderate speeds such as 1/125 can be used even for fast subjects

Jeremy Coulter



Daniel Barbier/Atlas Photo

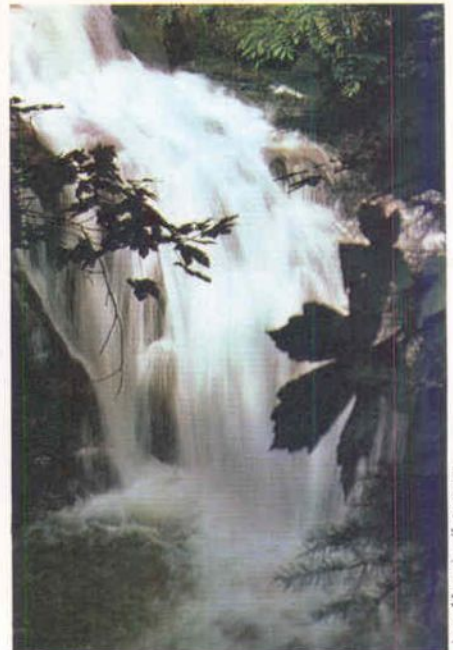




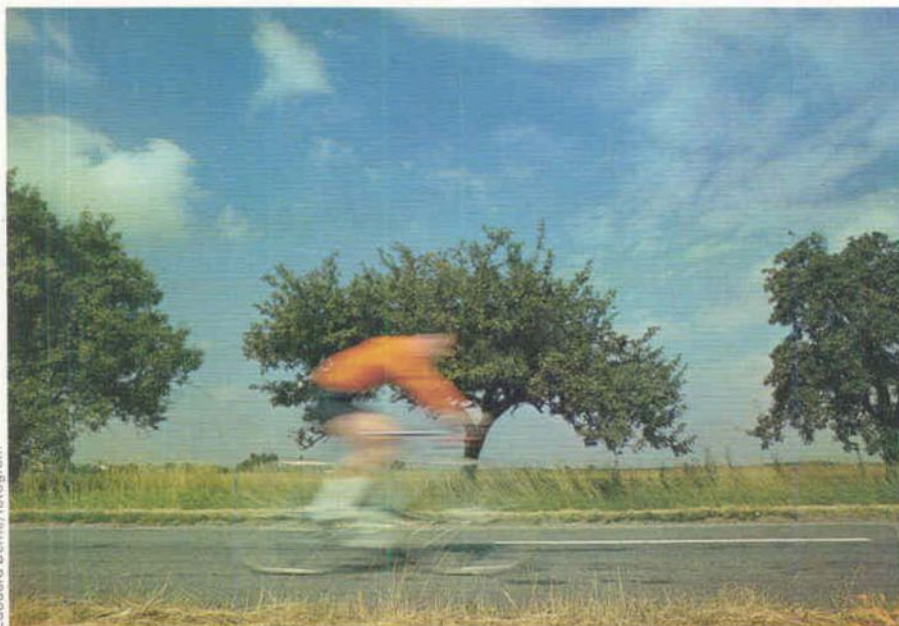
Gerard Del Vecchio/fotogram

Waterfall impact The sheer power of the water is suggested by using a brief shutter speed to freeze all movement in the subject

Flowing waterfall In marked contrast, but no less effective, is the result of using a slow speed (1/4 or longer) to indicate movement in the subject



Jean Mounica/fotogram



Edouard Bernier/fotogram

sharply: a galloping horse, for example, will come out with a sharp body, but blurred legs. However, the impression of speed given by a blurred background, or smudged hooves, can be the making of a fine, atmospheric shot. The best way to pan is with the camera on a tripod with a pan and tilt attachment but with practice excellent results can be achieved by hand.

Sometimes it is better to hold the camera still and allow the subject to move, so that its image is just a blur. While this can be effective, it doesn't always work: it depends on the amount of detail that remains. But the principle is always worth bearing in mind: you need not necessarily 'freeze' a moving subject for the most effective shot.

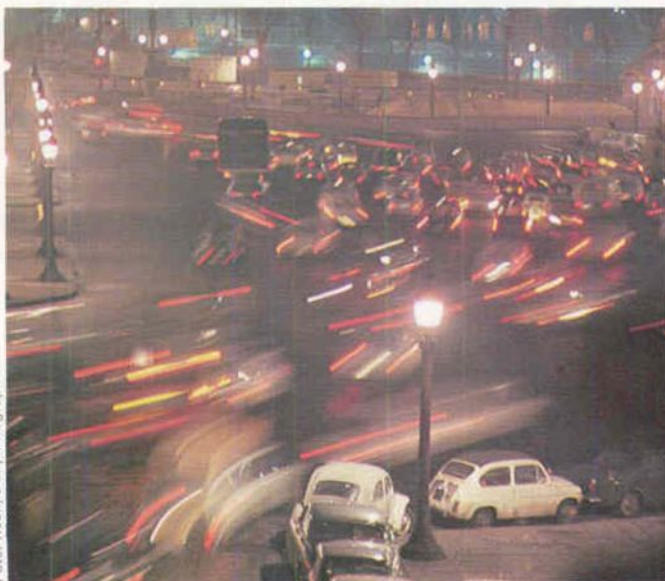
Long exposure times

The shutter speed dial of your camera has many speeds on it which most photographers hardly ever use—those longer than 1/30 second. These speeds almost always require the use of a tripod, but they can give exciting results when used properly.

Times between 1/30 and 1 second are invaluable when lighting conditions are poor and there is no movement at all in the subject. Additionally, they can be used to create the impression of movement in comparatively slow subjects, such as people walking.

For exposure times longer than a second you must use the 'B' setting. The 'B' stands for 'bulb'—recalling the days when all exposures were made by opening the shutter for a period of time, with an air bulb and flexible tube for vibration-free operation.

A remote release—either the air bulb variety or a cable release—is very useful for operating the shutter without joggling the camera. Exposures can range from a few seconds to several minutes, depending on the subject and the amount of light which is available.



Peter Keen/Daily Telegraph

Cyclist If you keep your camera still and use a fairly slow shutter speed, any subject movement is likely to show as blurring

Traffic trails You need to use slow speeds and time exposures for shots at dusk or at night. Trails formed by the lights of moving traffic can look particularly effective. A continuous trail requires use of long exposures and a really firm camera support



Zoom lenses

Zooms are good value and open up new horizons, but before buying one you need to know what its limitations will be

The zoom is now the most popular additional lens for a 35 mm single lens reflex (SLR) camera. Until recently, people tended to buy a fixed telephoto lens—but now, zooms account for over half of lens sales.

The idea of zoom could hardly be more attractive. Buy just one lens, at possibly no more than the price of a single fixed lens, and you have at your command a whole range of lenses of widely varied focal lengths—that is, giving different image sizes.

What is more, the zoom lens's focal length is continuously variable. By a quick adjustment of the ring on the lens barrel, you can magnify the subject in the viewfinder to the exact size required—within the zoom's range.

And all this is possible without the inconvenience of carrying around several lenses, or of changing lenses during picture-taking. A zoom can free you, in fact, to concentrate on more important things—like the subject in front of your camera.

Clearly a zoom can expand your photographic horizons. But on close consideration, how often would you use the lens? Would your photography really be improved by the continuously variable focal length? Would you really exploit its advantages to the full? And how does one set about deciding what to buy from the many ranges of focal length available?

Categories of zoom

For the 35 mm camera user, the choice of a zoom lens used to be restricted to one with a focal length adjustable from about 80 to 150 or 200 mm—generally described as a telephoto zoom. Today, this is no longer true.

Manufacturers are putting out increasing numbers of wide-angle zooms, with a typical range of 21 to 35 mm. And the medium-range, 'all-purpose' zoom, usually covering focal lengths from 35 to 80 mm, is also growing in popularity.

There is no set rule for the exact range of focal lengths offered in each category. Zooms of the telephoto type cover a particularly wide range. There are 50–135 mm, 90–200 mm, 70–230 mm, 75–150 mm, even 135–600 mm zooms—and one

Rising to the occasion *Without a zoom this shot would have been missed: the fox disappeared too quickly for a change from a standard to a long-focus lens*



Sue Walsham

Jane Burton/
Bruce Coleman

manufacturer offers a staggering 360-1200 mm model. But it is fair to say that the most popular telephoto zoom, usually considered the most versatile and manageable, remains the 80-200 mm. Indeed, this is now the most popular second lens for 35 mm SLR users.

Wide-angle zooms generally cover two zones of focal length: 24-35 mm and 28-50 mm. The medium range is more varied again, with combinations such as 35-70 mm, 40-80 mm, and 28-80 mm.

What the zoom can do

Most people would consider a zoom lens's greatest benefit to be that it allows you to fill the picture area over a considerable range of distances without having to change the camera position. At a football match, for example, you can follow the play from a single position, ranging from shots showing the distribution of the players over the field to moderate close-ups of incidents.

Another way to use a zoom lens, which applies particularly to the medium range types, is to help you compose your shots in the viewfinder. Pictures often need a small amount of trimming along all or some of their edges, either for added impact or for balancing the composition. If you have your own darkroom, you can do this 'cropping' as a matter of course under the enlarger. But many people prefer to have their prints or slides with no more fuss and bother, and want to get them right first time. With a zoom, you can make a quick, simple adjustment to obtain that all-important, last-minute alteration of the image size relative to the picture area.

A zoom also gives control over the apparent distance between objects. A short focal length lens (ie a wide angle) 'spaces out' everything in view, enlarging things close to the lens and reducing the relative size of objects in the distance. A long focal length (ie telephoto lens) does the opposite, closing up the spaces between objects in the dis-

ance so they seem to be closer together than they are. By looking through the viewfinder while you lengthen or shorten the focal length of a zoom, you can watch this widening and flattening.

Another major feature of the zoom lens is its constant focus. This means that you can focus precisely with the lens at its maximum telephoto setting, then zoom to a wider setting while the image remains critically sharp.

However, you should be aware that although the constant focus works perfectly on most good zoom lenses, there is sometimes a small change in focus that has to be corrected after zooming. Generally, the smaller the range of focal lengths offered by a zoom, the better it is likely to hold its focus. One type of zoom, known as the varifocus, needs to be re-focused every time its focal length is adjusted.

Many modern zoom lenses claim to offer a macrofocusing facility. This allows focusing on subjects very near the lens to give a life-sized image in the viewfinder, and, therefore, on the film. Such a lens has a quite remarkable range of uses, and, in theory, will stand you in good stead for not only action work at long range, but also close-up, nature or specialist photography.

The drawbacks

When people think about the full advantages of zoom lenses, they often ask why conventional lenses are bought at all. This is a fair question, to which, however, there are some good answers.

The greatest drawback is the zoom's poor light grasp for its size. A photographer accustomed to focusing on the bright image given by a standard lens working at, say, $f/1.7$, will be horrified at the low image brightness of a zoom whose maximum aperture is a mere $f/3.5$ or $f/4$. Not only is the image dimmer, but focusing is more difficult as the f -number increases. A few zooms, usually those with short focal lengths, do open up to $f/2.8$, but these are particularly bulky.

Added to this is the problem of increased light absorption. The amount of glass used in the complicated construction of a zoom absorbs and scatters light. It is a common experience for zoom users to find that when light is poor, the zoom makes picture taking impossible. Changing to a fixed lens, they find they can easily make a correct exposure at the same aperture; indeed, they may even be able to stop down.

Bulk is the second big snag. To achieve a successful zoom, the manufacturer has to use as many as 15, or even more, glass lens elements. This makes the zoom generally longer and heavier than an equivalent fixed focal length lens.

Most appreciate that in certain cases this is not a particular disadvantage because in any case the zoom is doing the job of two or possibly more lenses which would have to be carried about in its place. And it has to be said that some zooms have reached a remarkably compact standard of construction. But again



Theo Bergstrom

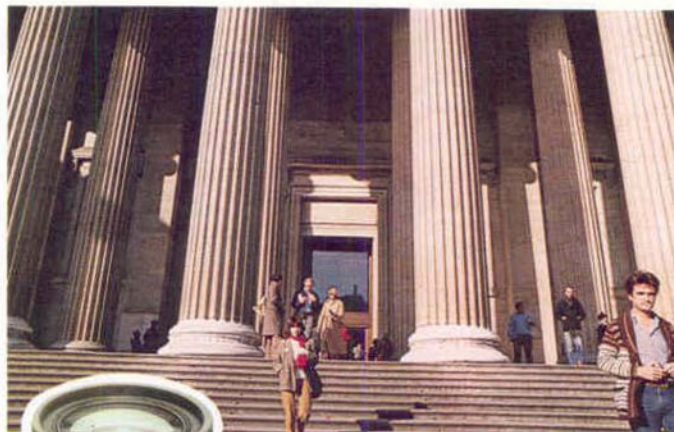
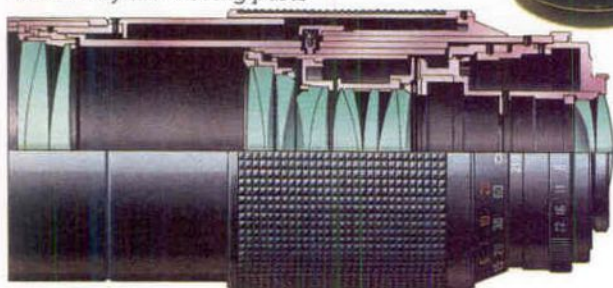
Typical zooms Part of a manufacturer's range—in this case, Tamron: top, an 80-200 mm, usually described as a telephoto zoom; centre, a middle-range zoom with focal lengths from 35 to 70 mm; right, a 28-50 mm wide-angle zoom

the most useful zoom lenses, with a wide range of focal lengths and comparatively wide maximum apertures, are also the heaviest. They will probably unbalance the camera, making it impossible to carry comfortably on the neck strap, and will certainly rule out the use of your ever-ready camera case. The wide-angle, or medium-range zoom, will not, under any circumstances, be as compact as a standard or wide-angle fixed focal length lens.

And at this point, the photographer has to make up his own mind about how vital compactness of the lens-camera unit is for his particular purposes.

You will hear conflicting reports about the image quality given by zoom lenses.

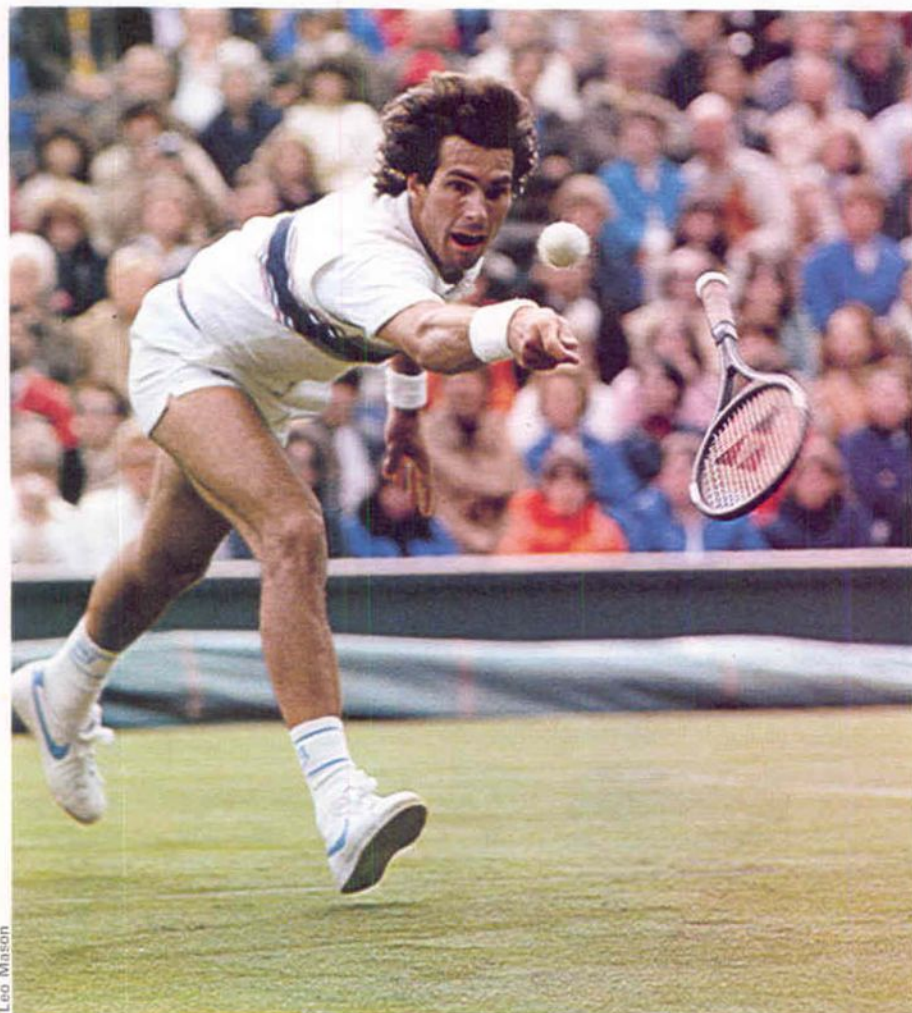
Zoom construction The cutaway shows the considerable number of glass lens elements required. The central groups are usually the moving parts



Wide-angle zoom The two extremes of the 28-50 mm zoom show how different pictures of the same subject can be taken from the same viewpoint. This type of zoom comes into its own for pictures of buildings and in built-up places generally. The 50 mm setting gives, in effect, a standard lens



John Heseline



Leo Mason

But it is fair to say that zoom lens performance has not yet reached the level of other, fixed focal length lens types, and probably never will. On the other hand, it is improving all the time, and a zoom of reputable make will perform acceptably for all but the most demanding photographers—provided it is used within its limitations, that is, not at full aperture, and, when on a long focal length setting, with a fast enough shutter speed to 'freeze' the resulting exaggerated effects of camera shake.

Sharpness, however, is only part of the story when it comes to lens performance. Such things as image contrast, distortion, vignetting (fall-off of light towards the edges) and lens flare are also important. In each case, the complexity of a zoom counts against it.

One other thing must be said against zoom lenses, which may not at first seem fair: they can encourage lazy photography.

Most will agree that one of the vital habits to acquire for good picture-taking is the urge to move about, looking for the best viewpoint, or that new and interesting angle for a shot.

A zoom encourages you to remain rooted to a single spot—in other words, not to experiment. Many a picture is taken with a zoom at its extreme telephoto setting when a standard lens could have been used simply by moving

Tennis A classic use of the telephoto zoom: the camera position is fixed, but the image size can be adjusted to fill the frame as swiftly as the players move

forward. The resulting picture is unsharp, because the telephoto effect has exaggerated camera shake.

You and a zoom lens

In photography, the considerations you make before buying a new piece of equipment almost always boil down to one, simple question: will it help me do my kind of photography better? The zoom lens is no exception.

Take, for instance, the long focal length, telephoto zooms. They come into their own when photographing active subjects where you cannot move your viewpoint, but the subject is always doing so. Football, motor racing, sailing and many other activities come into this category. So also do young children as they toddle about the garden.

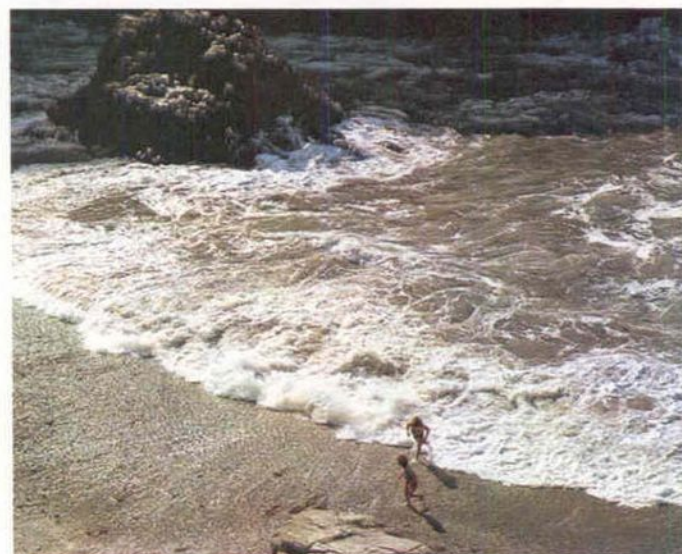
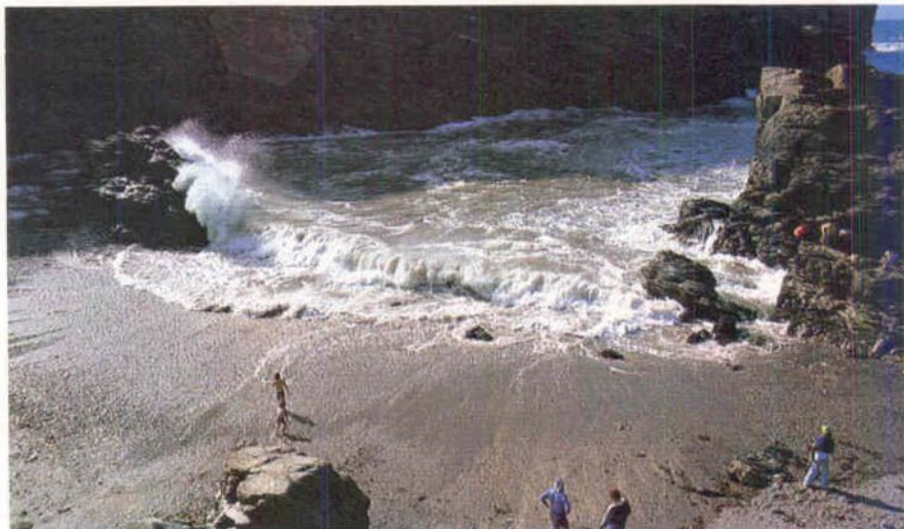
Both globetrotters and photojournalists find telephoto zooms invaluable for capturing candid shots. This is a classic use of the telephoto, and the zoom provides great flexibility when the photographer has no time to choose the ideal viewpoint.

So if this sort of photography is close to your heart, and you do it often, a telephoto zoom lens is well worth buying. But there is one caution: because of its relatively narrow widest aperture, it is best for outside work in the open spaces, with good lighting conditions, rather than indoors or in poor light conditions—unless it is used with flash.

For the same reason, a telephoto zoom is not the best lens for portrait photography. This is partly because one often wishes to work indoors by available light, when good image quality and the widest possible aperture count above everything; and partly because in the formal studio situation with the camera on a stand, the variable focal length is not needed.

The wide angle zoom is an interesting lens. If you enjoy using a wide angle for artistic reasons, or if you frequently photograph the interiors of buildings, or,

Definition loss We tested an 80-200 mm zoom at 135 mm and full aperture, $f/3.5$ (left). A fixed 135 mm lens (same make) performed noticeably better at $f/3.5$. Half of each image area is shown



Mid-range zoom
Useful as a general-purpose lens. Standing on the cliff above the cove one has a choice of a medium wide-angle view at 35 mm, or, at 70 mm, a closer view of the children and broken wave



at the opposite extreme, do plenty of landscape photography, it will probably be a good buy.

It will enable you to wander about, filling the frame to perfection, whatever size of room you need to photograph. Equally, it will enable you to adapt to photographing different sizes and areas of a building from the outside without changing lenses.

And for pictorial purposes, it can be useful, not to say fascinating, to be able to manipulate 'on camera' the appearance of a landscape, and how much of it you include in the picture.

It is more difficult to say what a medium-range zoom can do for your photography. It certainly covers some very useful focal lengths. At some stage, most 35 mm camera users find them-



Theo Bergstrom



Stewart Fraser/Colorsport

selves saying that 50 or 55 mm is just not a particularly useful focal length. It may give a field of view closest to that of the human eye, but relatively few subjects fit its angle of view with any ease. For landscapes, it tends to be either too wide or not nearly narrow enough; for portraiture, it has to be used too close to the sitter for comfort. People find themselves wanting just a little more, or less, focal length than the standard lens can give, and this is exactly what the mid-range zoom provides. So in theory it is an extremely useful, all-purpose lens.

As long as the photographer is prepared to live with its built-in drawbacks, this is true in practice as well. It

will not give corner-to-corner sharpness on big enlargements from 35 mm film. It will not give much freedom to work in poor lighting conditions. And it may limit the useful range of shutter speeds. But under normal conditions it can provide great flexibility and can offer great creative opportunities.

The same applies to zoom lenses in general. To sum up—are they worth having? The answer is a cautious ‘yes’—but be certain before you buy one that it will really be of use to your kind of photography.

The next article in this series deals with actually buying your lens, once you have decided to get one.

Telephoto zoom

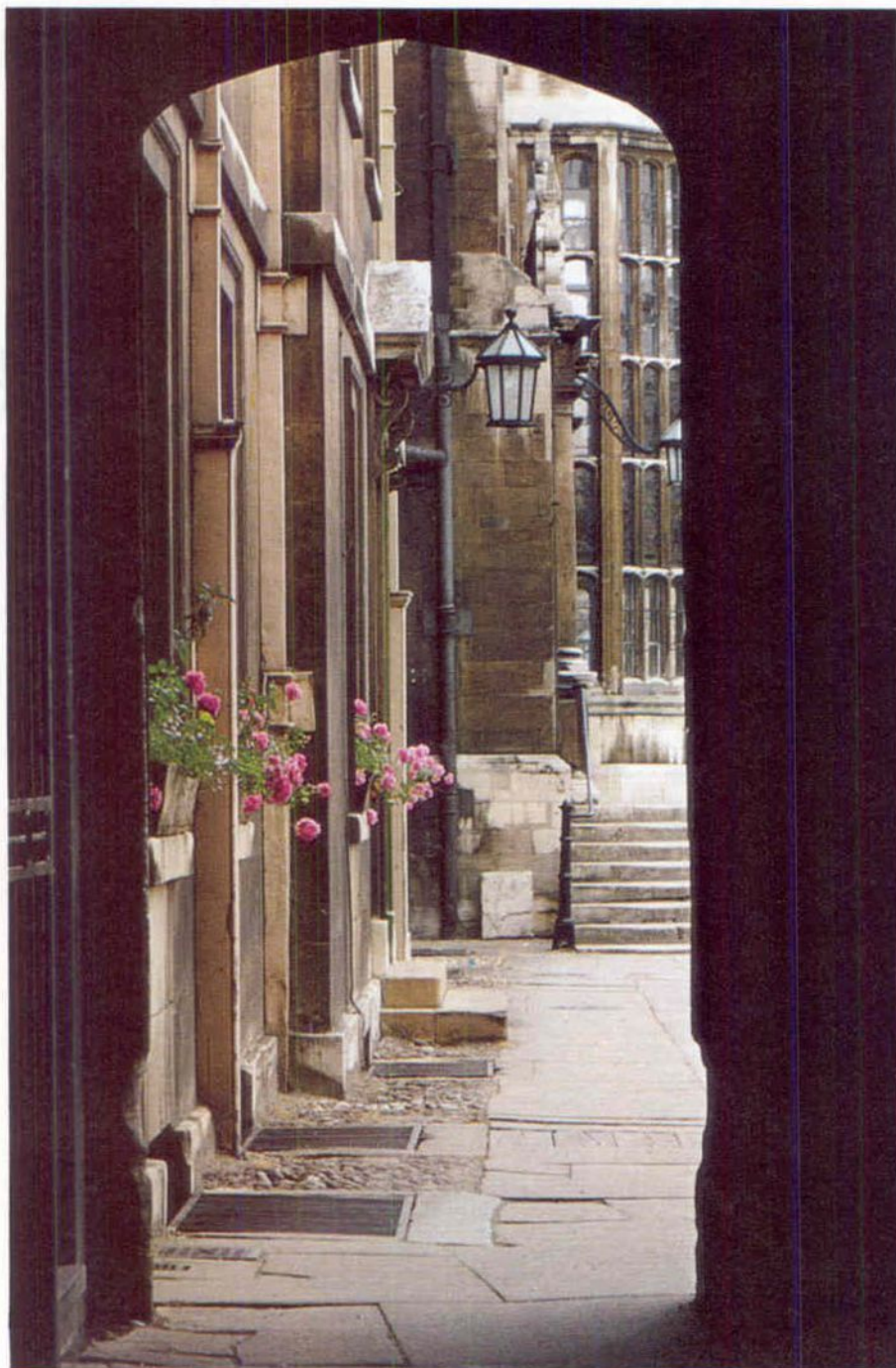
Often used for sports shots. This pair, taken from the same location at the extremes of an 80-200 mm zoom, shows how the widest setting gives an overall impression. The 200 mm shot allows more details to be seen





An eye for a picture

No one can be taught to take good photographs, but by avoiding a few basic errors you can develop an eye for composition and take better pictures



Good pictures are made in the viewfinder. A photographer may produce technically superb results with quality equipment and skilful processing, but unless the original image is right, he can rarely create a good picture. Not everyone is born with that elusive 'eye for a picture'—but with practice and common sense, most people can avoid common mistakes and improve their results.

Of course, there are no hard and fast rules that can be applied to guarantee brilliant creative photographs every time. Identifying a potential picture in the field and exploiting it to full effect is a matter of artistic judgement and cannot easily be taught. Nevertheless, there are a few guidelines that may give you an idea what to look for, and what to avoid.

While stunning results may sometimes be achieved by deliberately ignoring these rules, they should help you to learn from your successes and failures and develop your own photographic eye.

Using the viewfinder

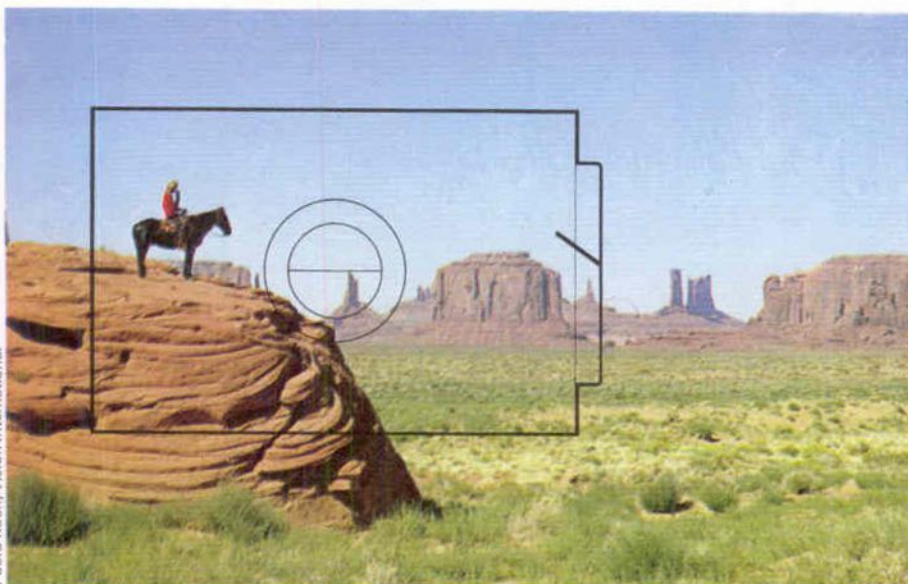
Perhaps the most valuable lesson the photographer learns from experience is to think before pressing the shutter; shooting first and asking questions later will almost inevitably waste film without guaranteeing a good shot. While there are some situations in which a moment's hesitation is a moment lost, it is often worth spending a few seconds studying the scene in the viewfinder.

Try to imagine the scene as it will appear as a print or slide rather than an image in the viewfinder. And ask yourself just what it is you want to photograph and what effect you want to achieve.

A panorama, for instance, requires an entirely different approach from a shot of a local church or an informal portrait. In a portrait of a child, for example, the child should be the centre of attention in the final result. This does not mean that the child must be right in the centre of the picture—such symmetrical images are often dull and lifeless—but that the viewer's eyes should be drawn to the child and not distracted by numerous other points of interest within the frame. Backgrounds should generally be kept simple and uncluttered.

This is where a good gaze through the viewfinder is so valuable. A camera is 'a mirror with a memory' and it will faithfully record every detail of the image it receives through the lens. The human brain is not so faithful to the eye and it is surprising how little of the scene you actually take in. You tend to concentrate on things that interest you rather than take in the whole scene. Because you are so absorbed with the child in the foreground, it is easy to miss an unsightly garden shed or the car parked behind, either of which may detract from the finished picture. Forgetting this can often lead to unintentionally amusing results.

Framing When taking landscapes and town scenes, it is often worth using a dark foreground like this archway to 'frame' the subject.



Viewfinder A camera records only part of any scene. The photographer must use the viewfinder thoughtfully and decide what to include and what to reject

Photographs of cars that appear to have sprouted lampposts, or dogs with flowers growing from their heads, have been taken by even the most experienced photographers from time to time.

Dealing with distractions

If you do spot potential distractions in the background, try moving around until they are outside the frame and you are left with a simpler, stronger picture. Alternatively, adopt a very high or a very low viewpoint so that the background is mainly sky or ground. If the background seems to intrude from every angle, move in close until your subject dominates the picture in the viewfinder.

Moving in close has a number of advantages—it makes the photograph simpler and helps to fill the frame out with the central image, giving it more weight. But be careful when you are closing in; you may lose the background altogether and get a rather abstract result. Or you may find that objects nearer the lens are unnaturally large. People sitting facing the camera can acquire giant feet or huge bulbous noses simply because of the apparently dis-

torted perspective at close range.

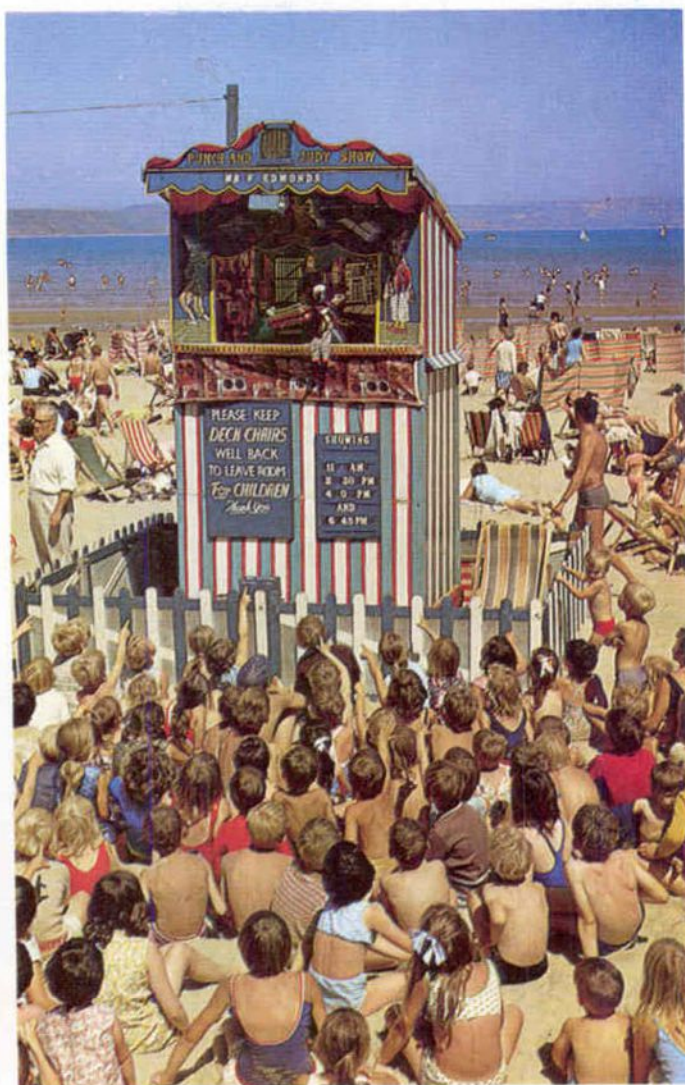
One technique that experienced photographers use to simplify the background is to set the camera on a wide aperture to restrict the depth of field. This enables them to focus selectively on the object of interest and keep the background blurred and indistinct. This effect is more

Format Many pictures are taken with the camera horizontal, but a vertical format can lift an otherwise dull photo out of the ordinary. Compare the picture below with that on the right. Notice how the extra foreground gives the vertical picture depth and how a narrow frame and the children pointing eagerly emphasize the show as the focal point of the picture. The horizontal picture has little depth and many distractions

easily achieved with a telephoto lens than with a standard one, which is one of the reasons why a lens with a focal length of about 90 mm is chosen for portraits by many photographers in preference to the standard 50 mm.

As well as not competing with the subject, the background can also be made to complement and highlight it. A dark subject generally looks better against a light background and vice versa. A filter over the lens can help to emphasize any difference. When using black-and-white film, an orange or red filter will darken a blue sky almost to blackness and so show up a light-toned building or figure. Such filters can also make a sky more dramatic by making white clouds stand out against the dark sky.

In a similar manner, a visually complex subject will look far more impressive against a simple background such as the sky while the impact of a very simple object is often enhanced by a dense background. But complexity in the background depends on more than simply the number of individual details. In colour shots, a profusion of various colours can be just as awkward to deal with. When photographing a friend in a garden, for instance, it is usually better



Using lines Look for lines and patterns in a picture—they can make or break it. Here the lines of the avenue and trees help to lead the eye into the frame

to move the subject closer to the flower bed and use a background of one colour flowers rather than set him or her well away against a riot of many coloured flowers, however pretty they may look.

Creating depth

While the original scene is in three dimensions, the final photograph is only in two. If the picture is not to appear dull and flat, there must be an illusion of depth. Your subject should appear to stand out from its background and be obviously some distance in front of it. Composition is an important part of this process of creating the illusion of depth, but so too are colour and tone.

Certain colours and tones have significantly different visual depths. Light tones come forward while blacks tend to recede, and a strong picture is more easily achieved by photographing a light subject against a dark background than vice versa. However, careful use of lighting—such as strong backlighting on the subject—can lift even a dark subject out of the picture.

Similarly, warm, bright colours such as red and orange appear to move out from the picture while colder colours such as blue and green tend to recede. Blue sky therefore makes a good background to most subjects. It is simple, and except when the sky is completely empty of clouds, is sufficiently interesting not to be lifeless. Being blue it helps to push the subject forwards.

In landscapes, you can use the foreground to create the illusion of depth. Dark and light areas have a different

effect in these pictures. In real life, the distant hills in a panorama appear much lighter and in more muted colours than the nearby trees. To put depth in your photographs, this effect can be recreated. Try to enliven a panorama by placing a strong, dark object in the foreground. This should be a simple shape, though, so that it complements the detail of the distant view. Silhouetted trees, for instance, frequently uplift a misty distance view.

But where in the picture do you locate all these elements? This is a question of balance and composition. Although people have tried to formulate rules in the past, none have been particularly

successful. Yet while balanced composition remains largely a matter of personal judgement, there are a few basic points to watch for.

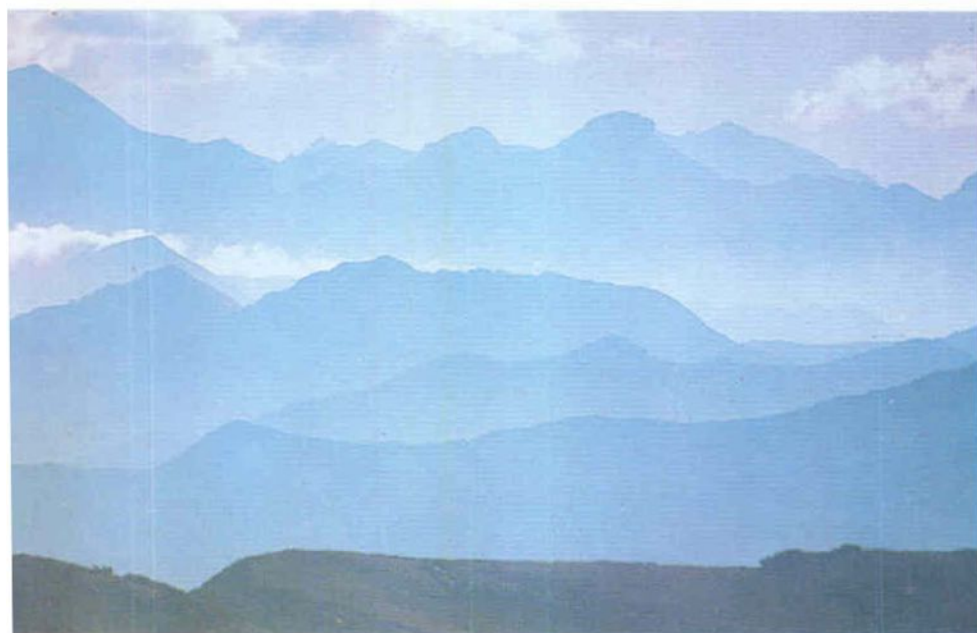
If, for instance, the horizon is placed half-way up the frame, the sky and ground are two equal areas competing for attention. Sometimes this can be dramatic, but usually the result is unsatisfying. If you want to take a picture of the sky, let the sky occupy more of the frame; if you are interested in the ground, let the ground take more space.

Complete symmetry is rarely pleasing. You can usually get a better picture by approaching subjects from an angle rather than flat on. Pictures of people



Chris Bonington/Daily Telegraph

Depth Foreground hills appear much darker than those far away. By including dark foreground objects you can create an impression of depth



Patrice Tourenne/fotogram





Balance Variations in the relationship between the important elements of a picture have a tremendous influence on its final impact. In this picture, the glowing gold of the wheat completely overshadows the house and trees behind. Were the wheatfield to occupy only a small area of the frame, the rest of the picture would still seem dull by comparison. So the photographer has made the wheat his subject and allowed it to fill two thirds of the frame. The contrast provided by the sombre colours of the house and trees heightens the colour of the ripe corn

staring straight into the camera tend to look dull and lifeless. A country lane scene usually looks better from one side of the road rather than looking straight down the middle. But of course, because oblique views are generally preferred, head-on views are unusual and may be visually arresting.

Lines in the picture

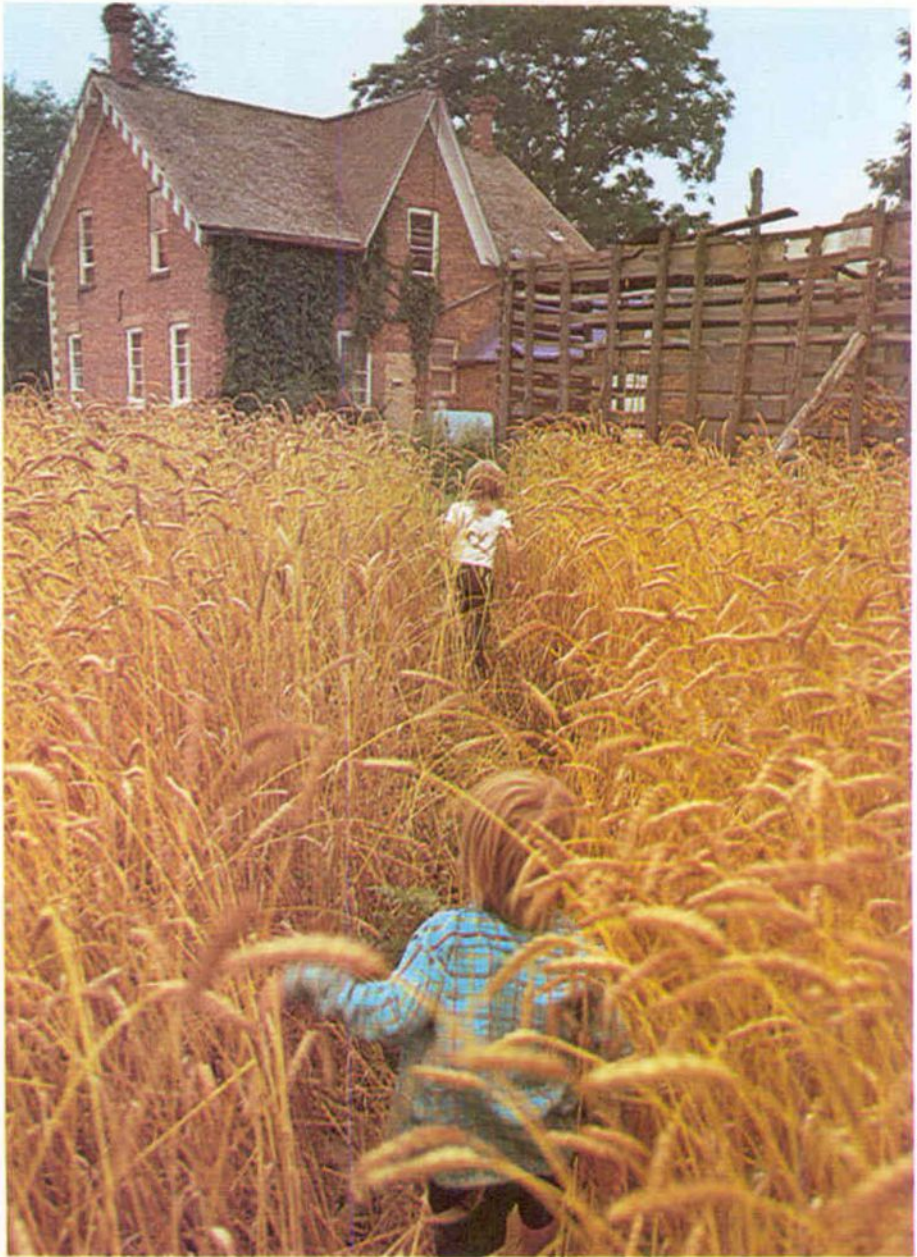
Look for lines and shapes within the picture and try to work out what they do to the overall effect. Strong parallel horizontal or vertical lines tend to break up a picture but like head-on views can occasionally be used to great effect.

Pictures where the eye is led towards the centre of the picture are generally more pleasing than those that appear to have no central point of visual interest. Lines converging towards the centre or top of the frame complement perspective and draw the eye into the picture. Diverging lines prevent the eye moving easily towards the centre and generally make the photograph much less satisfying. Similarly, highlights are best kept fairly near the centre; otherwise the eye tends to wander out of the frame. In fact a dark area 'framing' the scene—such as a silhouetted archway or branch—can complete the picture and hold the viewer's attention.

Balance

Although again there are no infallible principles, a well-balanced picture can often be achieved by using the 'inter-

Distractions Water seems to be gushing from the woman's head because the photographer failed to notice the fountain



G. Boutin/Atlas Photo

section of thirds' idea. If you imagine a picture divided into three, horizontally and vertically, then placing a subject at any of the intersections of the horizontal and vertical lines contributes to a balanced result. This seems to work because the extra visual weight of the subject is balanced by the larger but visually lighter remainder of the frame. Alternatively two points of interest could be located at diagonally opposite intersections.

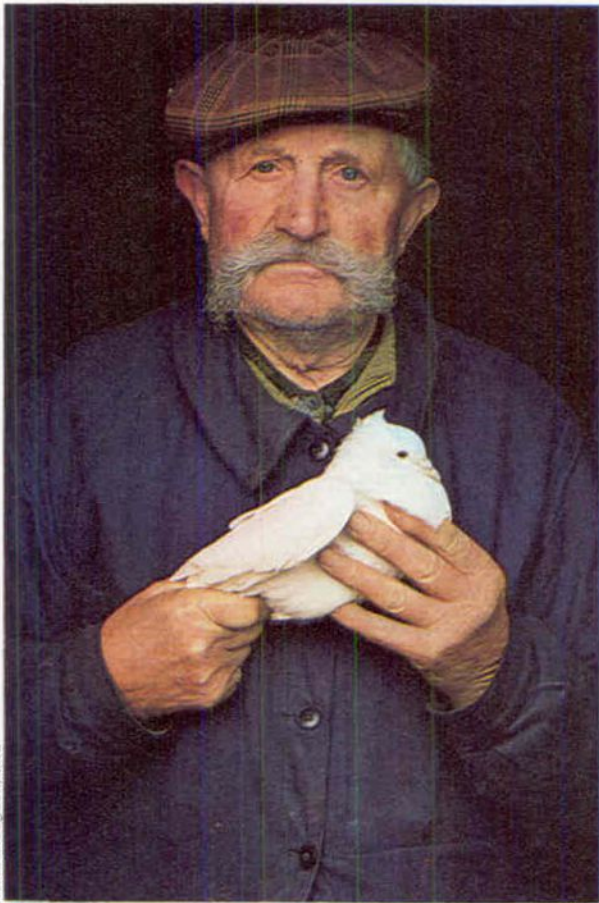
Different colours and different tones (in black and white) have different visual weights. Even small highlights and splashes of bright colours (such as red) have a great deal of impact and should not really be near the edge of the picture—unless you want to achieve some special effect. If they have to be near the perimeter, try to balance them out with large areas of lighter tone or another point of interest.

When using colour, a whole new range of possibilities open up. Beware of shoot-

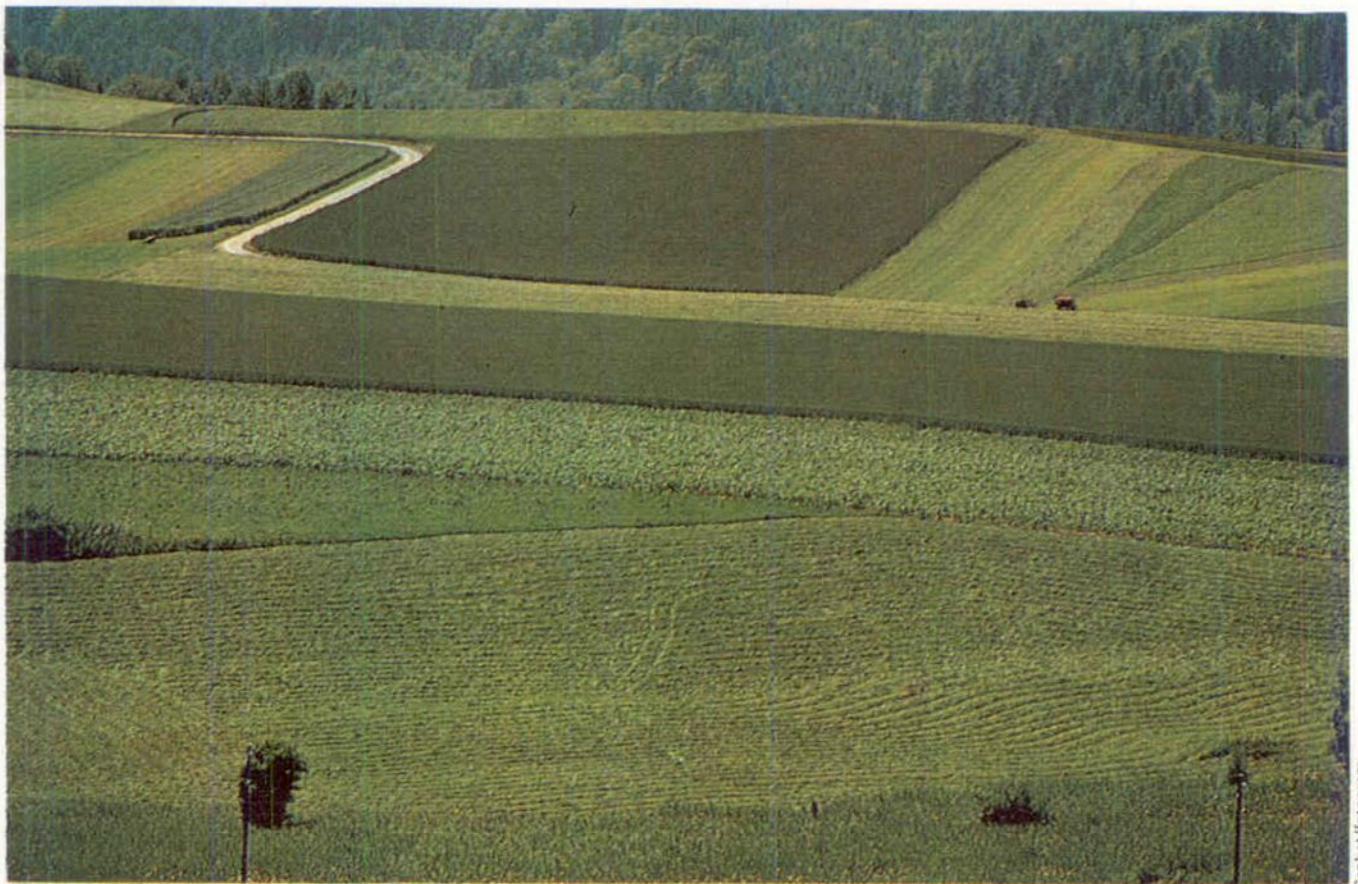
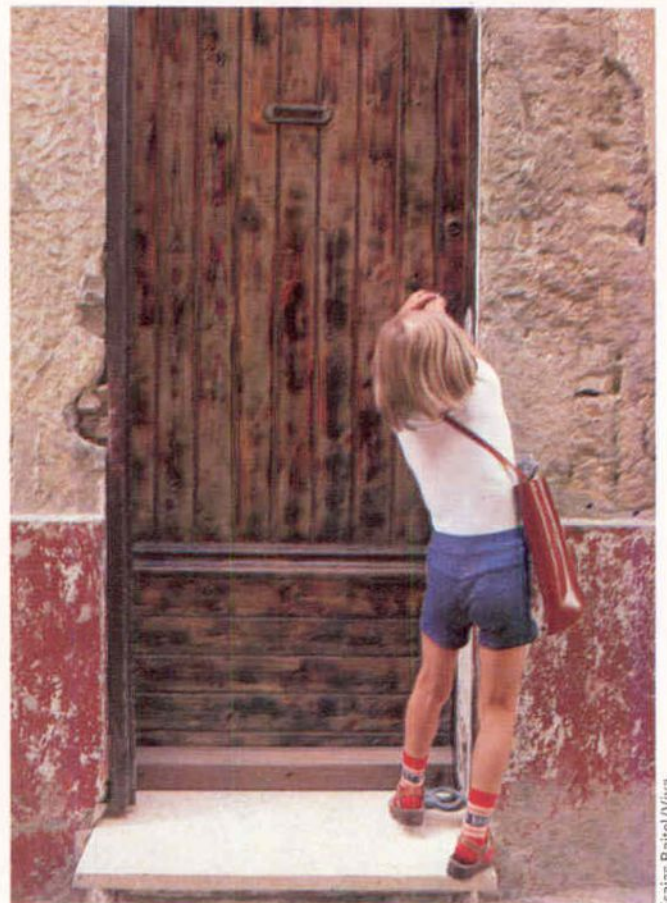
ing colour for colour's sake, however. While a mass of bright colours in a carnival may appear an ideal shot for colour work, you will probably get better results by having just one or two small areas of bright colour. Place a parrot and a colourful bouquet in the same picture and both will compete for attention. But a few splashes of bright red among the pastel greens and browns of a misty woodland can make a picture sparkle.

Whatever advice you are given, however, photography is ultimately a matter of personal experience and judgement. Though exotic locations lend themselves to exotic pictures, beautiful or interesting photographs can be found anywhere. To improve your eye, look around your home or go out into your local neighbourhood and try to look at everything with a fresh eye, exploring even the most mundane objects for photographic possibilities. You may be surprised how much material you can find.

Hervé Gloaguen/Viva



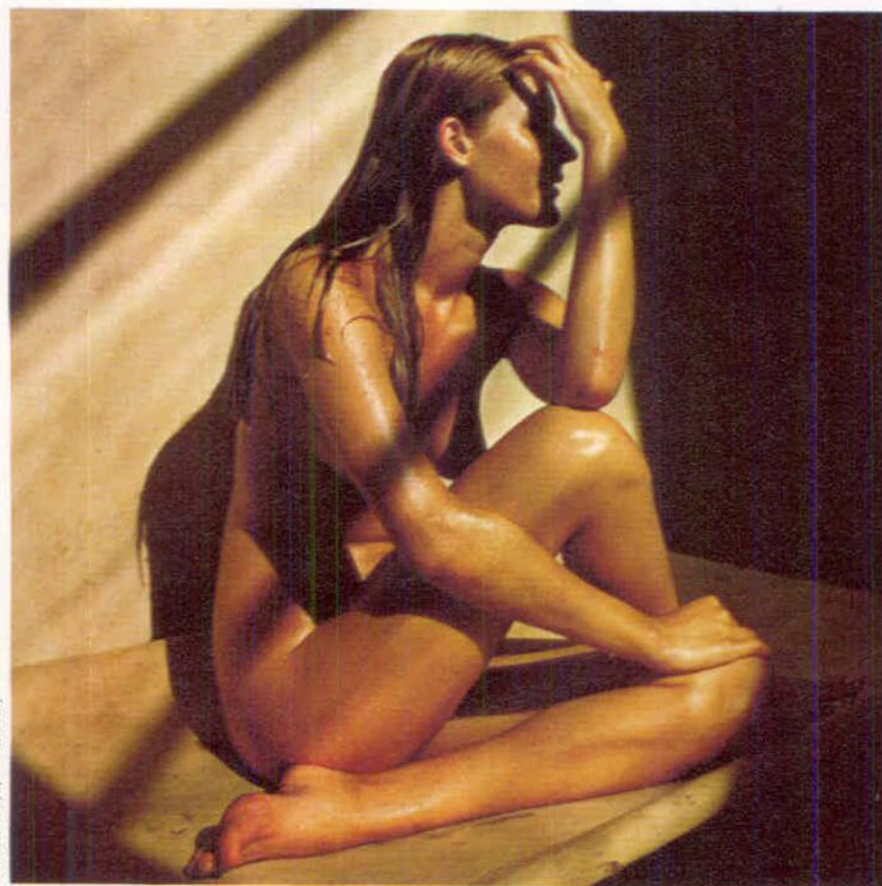
Enias Baitel/Viva



Grobet/fotogram

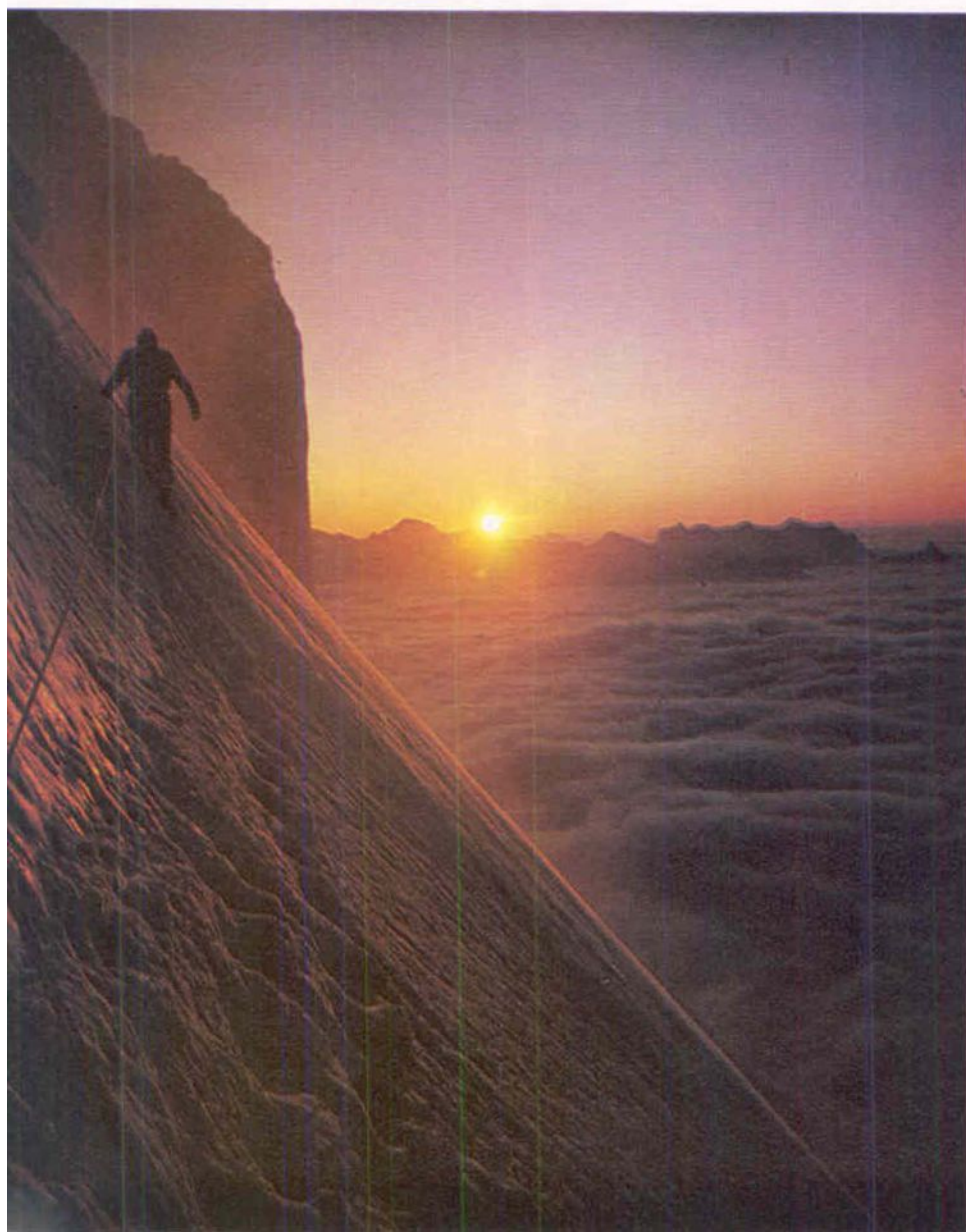
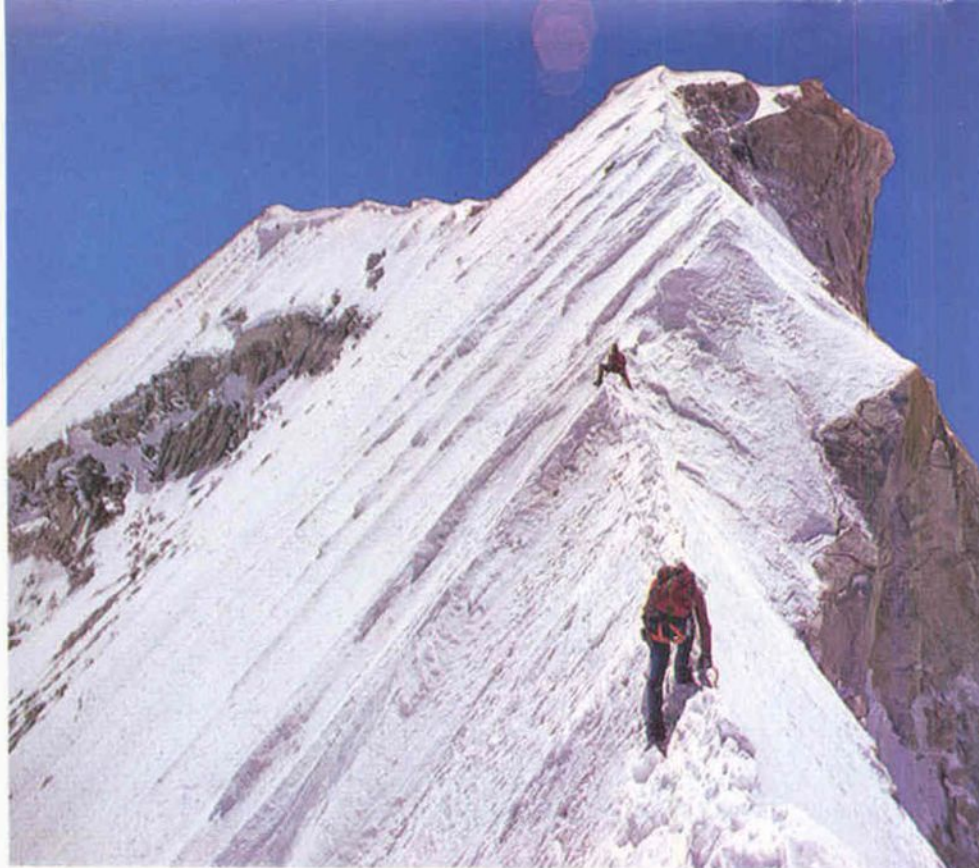
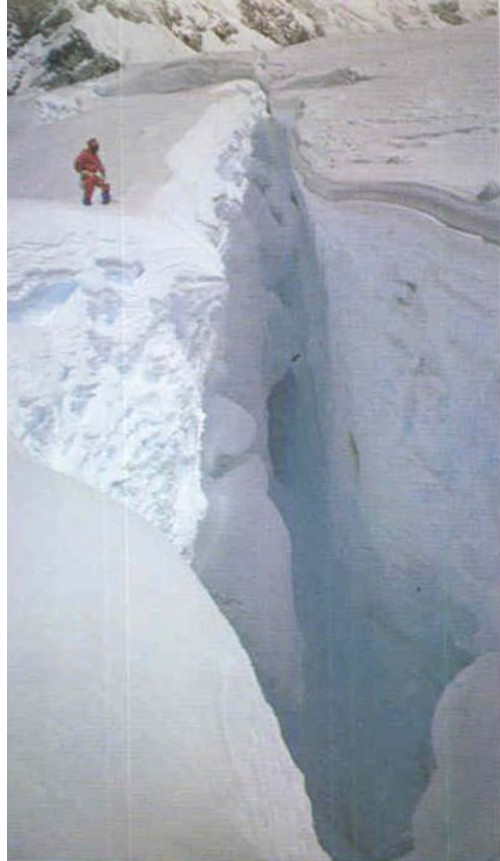


Grobet/istogram



Michael Boys/MC Library

Simplicity and style Although these photographs cover a wide range of subjects, they have one thing in common: they are all beautifully simple. In each case, the photographer makes it abundantly clear what he is shooting and allows no extraneous detail into the frame to distract attention away from his subject. **Old man** The plain black background and dark jacket bring out the rich colour and texture of the skin. With the man looking straight into the camera, it is a wonderfully direct and honest picture, but it avoids the usual harshness of such head-on views by including the dove cupped in his hands at the centre of the frame to balance the face. The result is a gentle and touching portrait. **Child opening the door** shows the value of thoughtful composition to create an enchanting photograph. By keeping the child small in relation to the frame and placing him in the bottom corner, the photographer has mimicked the way the child is dwarfed by the door. But because the rest of the picture is so simple, it does not distract attention from the tiny figure. Notice how the curve of the little boy's body as he twists the door handle contrasts with the straight lines of the door frame and wall. **Landscape** is unusual in having no obvious focus of attention, but it works by virtue of the strong pattern of fields and lane. **Snowscape** shows how effective a single red highlight can be and the **nude** forms a beautifully compact but intricate shape





Bonington

The mountaineering photographer is a new breed—skilled in both climbing and photography. Expeditions such as British mountaineer Chris Bonington's Annapurna climb have produced spectacular shots

Today's mountaineers have learnt the value of good photography on their expeditions. Apart from the thrill of seeing again those dramatic sights which can be gained at first hand only by a few people, the resulting books and films can be lucrative.

For Chris Bonington, the British climber who made his name leading the ascent of the south face of Annapurna in 1970, photography has become a part of life. The photographs which he takes on expeditions are hot property, and earn a considerable income in reproduction fees—which helps to finance future expeditions. And for the equipment manufacturers, a Bonington shot showing their product in use helps to sell the goods. Indeed, expeditions obtain their equipment and supplies in return for publicity photographs.

Not that just anyone bored with the commuter's life could persuade manufacturers to part with costly goods in return for a few snowy shots. It takes the skill and renown of someone like Bonington to guarantee results. So how did Bonington's photographic career begin?

Bonington began climbing while he was still at school, but at first he had no thought of taking pictures. He joined the Army and was posted to Germany where the Alps challenged his mountaineering skills. At that time he bought his first camera, a standard non-reflex 35 mm model which he used on climbs.

Chris Bonington's break into the big league of mountaineering came in 1962 when he joined the first British expedition on the north face of the Eiger. By this time his camera had been stolen—so his photographs of the historic climb were taken on a Kodak Colorsnap camera which he borrowed from his mother!

After this Bonington turned to full-time climbing, supported by writing and lecturing. He credits his wife, an artist, with turning him into a photographer by making him much more visually aware, and he decided to improve his photographic abilities. He bought two Pentax bodies, together with 28 mm, 85 mm and 200 mm lenses. 'I think that's a basis that's



Annapurna 1970 Bonington using his old Nikon with a 200 mm telephoto. In 1974 he changed to a compact 35 mm SLR

good enough for anyone,' he says. After a while he showed his work to the *Daily Telegraph* newspaper when they asked him to write a piece on mountaineering for their colour magazine, which resulted in their sponsoring him to take photographs on a new ascent of the Eiger. 'Of course, there were dozens of much better photographers than me but these photographers just couldn't have got halfway up the north wall of the Eiger.'

Hunting with the Eskimos

More assignments as an adventure photographer followed. Bonington was sent on locations which ranged from an active volcano in Ecuador to the icy wastes of Baffin Island, so his cameras

had to perform in varied conditions.

'On Baffin Island in the middle of winter we went hunting on dog sleighs with the Eskimos,' relates Bonington. 'We were against huge technical problems because the temperature was really bitterly, savagely cold. At that stage I was using Nikons and Leicas. One of the problems was that although the Leicas function superbly in cold conditions, the angle of the take-up spool is so acute that when you come to rewind in ultra-cold conditions you just snap the film. So you'd have one camera kept right inside your fur jacket—a horrible cold camera with only a couple of layers between it and your skin—and be shooting with the other. Then you'd change the cameras over so one would slowly warm up and you could change the film.'

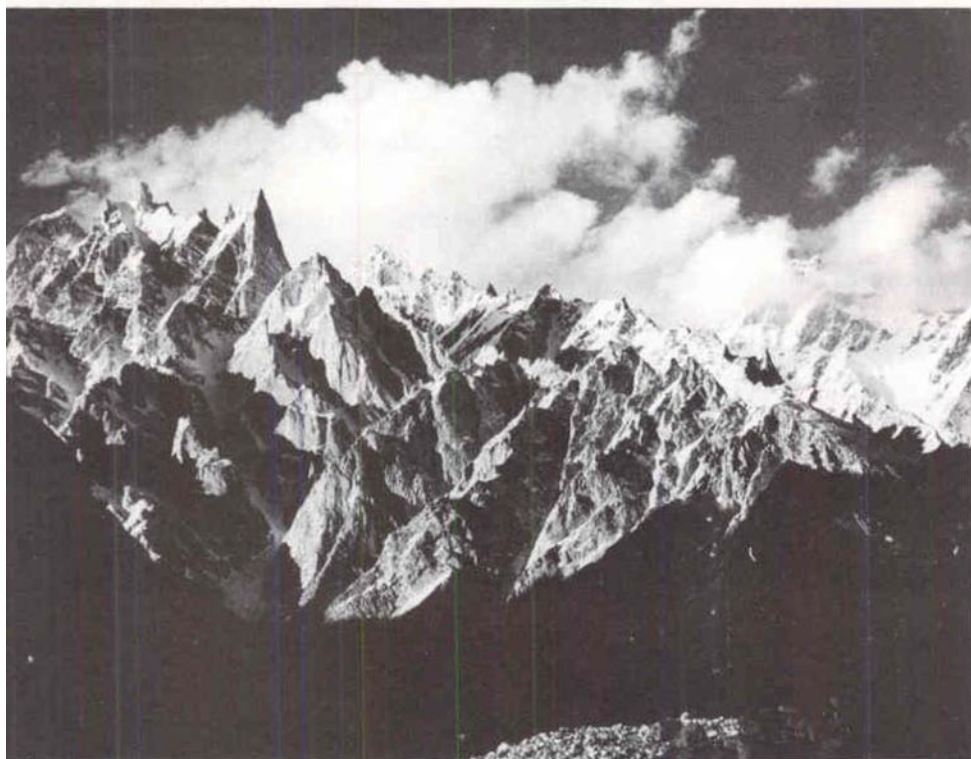
What is the practical low temperature limit? 'I think you're fine down to about -40°, and after -40° you start having problems. The enemy is cold-damp—if you get any damp into your camera, it freezes solid.'

In 1970 came the Annapurna expedition, and Bonington again devoted his whole time to climbing. On Annapurna he used Nikons with lenses ranging from 24 mm to 500 mm, on the lower slopes. Higher up he used a Leica M2 rangefinder camera, with 21 mm, 35 mm and 90 mm lenses, because of its small size com-

Hunza Valley, Kashmir Bonington's eye for a picture does not only operate in dramatic, high altitude scenery



Opposite page, clockwise, starting top left: **Everest West Cwm**; **Changabang, Himalayas** 150 metres below the summit; **Changabang** A typical cloud effect; **Adverse conditions** When cloud comes down there are still chances for pictures; **The Eiger, Swiss Alps** Ice fields at dusk



Dramatic shadows (left) Low side-lighting (causing the shadows) and a deep orange filter (to darken the sky) do justice to the Baltoro Spires in Kashmir.

Annapurna, Himalayas (right)

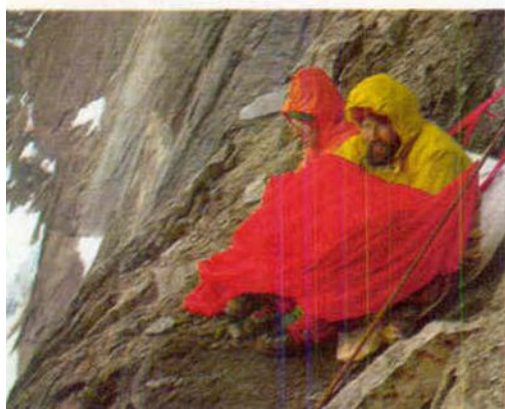
Climbing fixed ropes on the south face

seem to make much odds if it's cloudy.'

A slow, fine-grain film such as Kodachrome 25 is ideal in bright, snowy conditions but is unsuitable in poor light, when long exposure times become necessary. To save having to take a tripod up the mountain, Bonington has had ball-and-socket attachments adapted to clamp on to an ice axe. 'You dig the ice axe into the snow so it's absolutely rigid, and then clamp it on. It makes a perfect monopod.'

All the petty annoyances which photographers suffer become much more aggravating when you are trying to climb a mountain. Snow on the lens can of course be a problem, so you keep the lens cap on as long as possible. While it's possible to handle a camera wearing gloves, the lens cap can be awkward; so Bonington uses push-fit caps rather than those with a catch at the side, and attaches them to the lens by fishing line.

Chris Bonington



Chris Bonington/Bruce Coleman

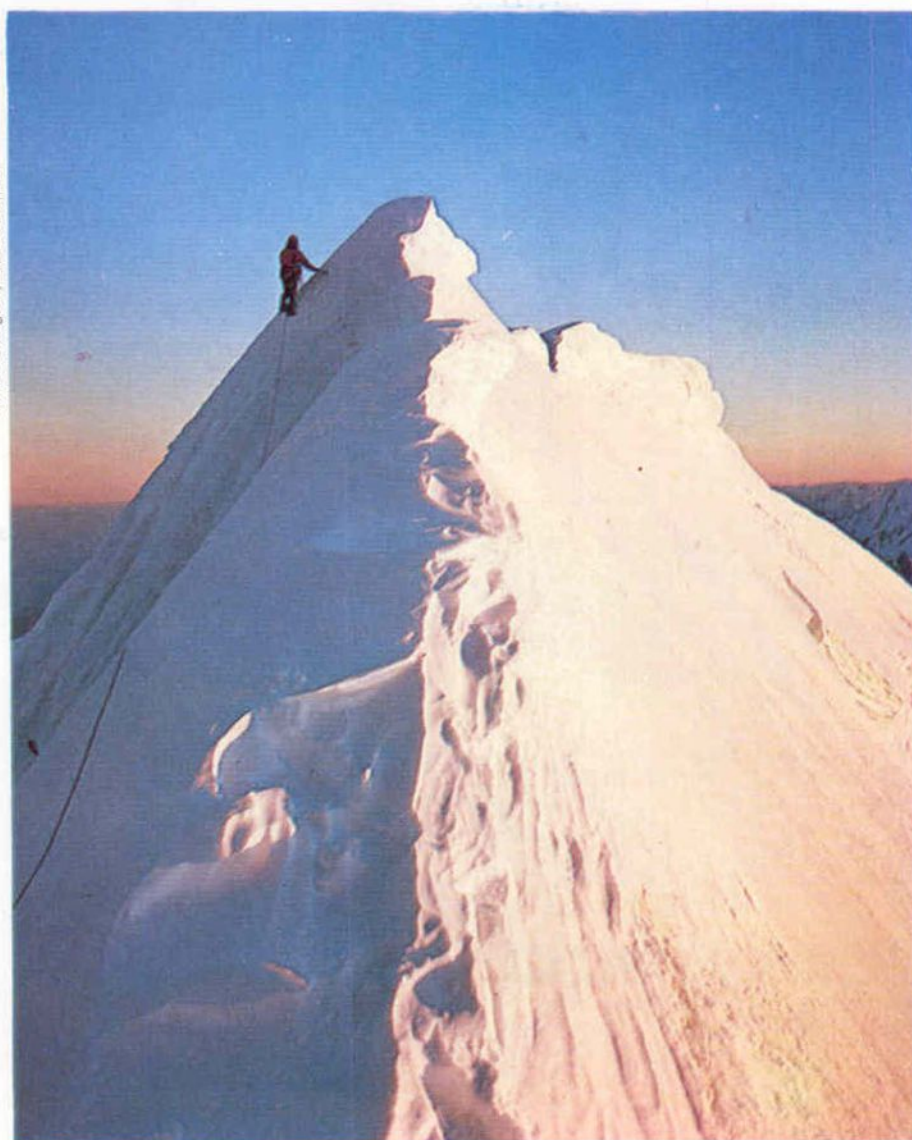
Alaska (above) Bonington (in yellow) and a fellow climber bivouac on Mooses Tooth, near the Mt McKinley range.

Mt Tasman, New Zealand Alps (right)
A lucky shot taken soon after dawn—the area is infamous for its appalling weather

pared with the old-style Nikons.

The coming of the Olympus compact SLR made it possible to use the same camera all the time because of its lightness. 'I've got a very wide range of lenses but I tend to go for a 28 mm lens on the camera, and that 75-150 zoom, and those are the only two lenses I shall carry with me on the mountain. I shoot in Kodachrome and then have black and white negs made when I want them. I tend to use Kodachrome 64 on the approach march, but the moment you're above the snow line you've got to start using Kodachrome 25.'

He uses the TTL metering of the Olympus, overriding it if necessary for shots against the light. 'The exposures are remarkably consistent—somewhere between 1/250 at f/8 and 1/250 at f/11 in the Himalayas in the snow—it doesn't

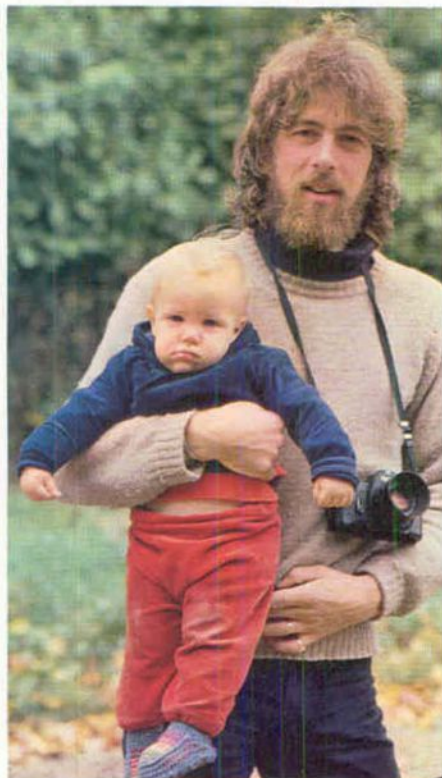


Chris Bonington/Bruce Coleman



Photographing your baby

'Piece of cake,' said photographer George Wright when we asked him to photograph his daughter, Ruby, on the lawn. But it turned out to be not so easy . . .



Lighting George aimed to have the sun coming over Ruby's shoulder in this session so that just the edge of her face was caught by direct sunlight and there were no harsh shadows. Slight back-lighting also helped to soften the outline and ensured that George's own shadow was kept well out of the frame

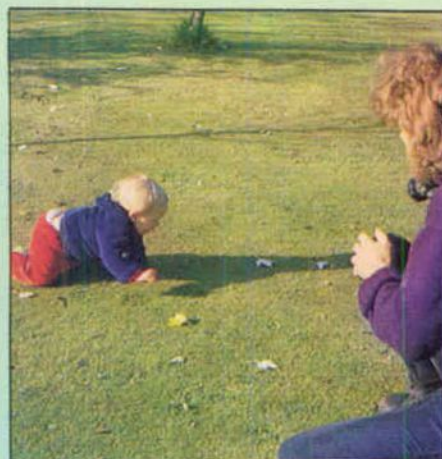
Over the months, George has tried to make a photographic record of Ruby as she grows. He has photographed her in many locations and in many of her changeable moods and we thought that this assignment would present few problems. But we asked George to show us what can go wrong.

George did not feel the lawn was an ideal location because light reflected from the bright green grass can give everything else a green cast. But there are a number of advantages for beginners. There is usually plenty of natural light available. The green shows up strong colours like red particularly well.

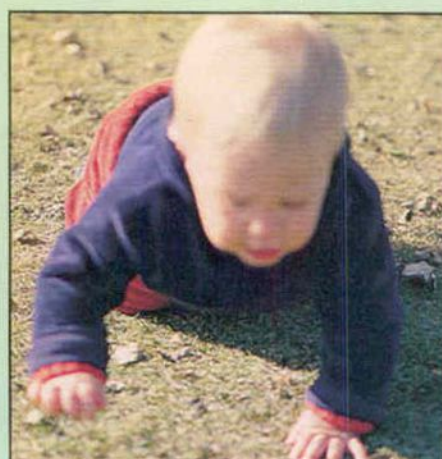
And above all, there is plenty of space for the baby to move around in without getting up to mischief.

Although it meant that Ruby sometimes had her back to the camera, she was allowed to crawl around the lawn freely and George simply waited for the right moment before pressing the shutter.

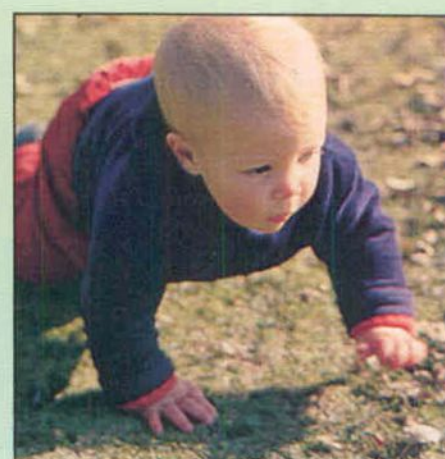
Of course, with Ruby moving around constantly, George had trouble keeping her in focus, but by carefully 'pulling the focus'—adjusting the focus on the camera as Ruby moved towards him—he was able to keep pictures sharp. He could have achieved the same effect either by holding the focus and snapping the



Panning George followed Ruby closely as she crawled across the lawn but sometimes she moved towards him . . .



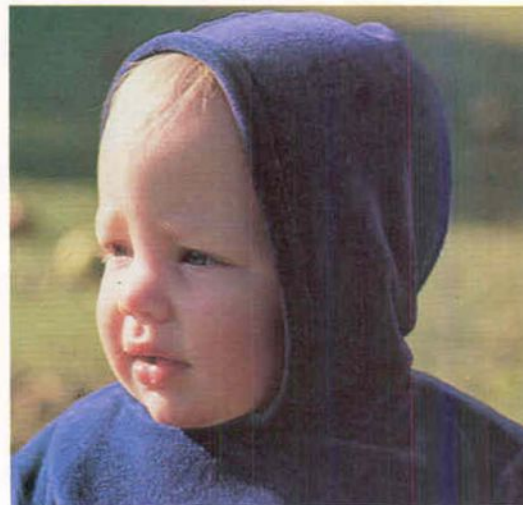
Out of focus With a wide aperture, depth of field is restricted and it can be hard to keep a moving baby in focus



In focus Here George successfully 'pulled focus' as Ruby came forwards, but has not maintained a good viewpoint



Distractions George failed to notice the apples that seem to have spun from Ruby's ears in the picture on the right



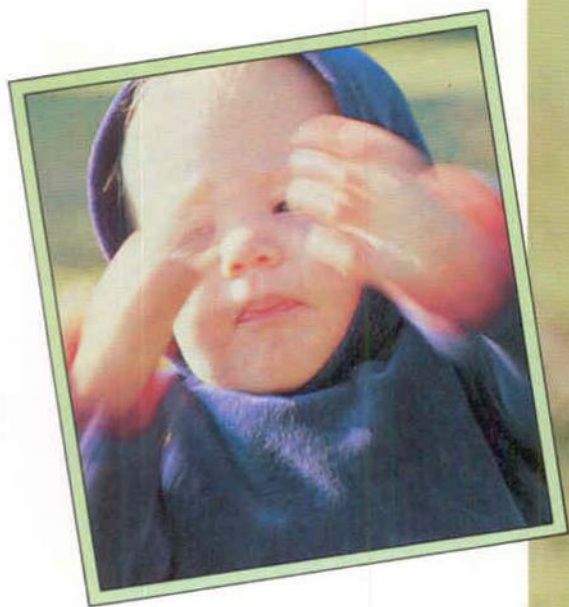
Almost right Careful cropping at the printing stage cut out nearly all the background distractions in this shot

shutter only when Ruby was in the right place or by following her around and keeping her at the same distance all the time. Neither of these approaches seemed satisfactory. By simply holding focus from a fixed position, he would miss many potentially good shots and by moving around with the baby he encountered all sorts of other problems. Pulling the focus requires a little practice but George found it by far the best technique in this situation.

Ruby herself found the camera fascinating and kept extending sticky fingers towards the lens and she was definitely aware of being the centre of attention. So none of the pictures were unposed and candid on her part. Candid pictures are only possible if the child is completely absorbed in some other activity.

Equipment

For this assignment, George used a 105 mm lens, slightly longer than normal, to fill the frame with his subject without getting intimidatingly close. With plenty of light available, he was also able to shoot with fairly slow Ektachrome 64 film, giving good quality results.



Watch those hands The situation was right—Ruby was close to the camera and obviously happy—but she began to clap just as George pressed the shutter

The final picture Instead of giving up when Ruby started clapping, George waited for her to stop for an instant and then captured this delightful picture



George Wright



Darkroom

Creating your darkroom

Darkroom work is at the heart of creative photography in both black and white and colour. Setting up a darkroom is not as difficult as you may think, and the results can be fun as well as economical

Emerging from the darkroom with a beautiful print can be one of the most rewarding experiences in photography. It has been, from start to finish, entirely your own work, and it has been a success. Yet the mystique of the darkroom is sufficiently powerful to frighten off many amateur photographers. Darkroom work can be frustrating; it can be laborious; it can sometimes be expensive; but once you have got the hang of the basics, it can be great fun and, if you take a lot of pictures, it can save you money.

With a darkroom, you can buy film cheaply in bulk and load it into film cassettes yourself. You can develop films yourself, producing the results within a matter of hours rather than days and you have the freedom to alter the character of the film by special processing. And you can do your own enlarge-

ments and prints, employing tricks to produce special effects such as those shown on these pages.

Converting a room

Very few people have constant access to a well-equipped, permanent darkroom or even have an ideal room for instant conversion. Yet it is surprising how much you can do, in the average house, even when every room is in continuous use.

The room that everyone immediately thinks of when setting up a darkroom is the bathroom. This certainly has many advantages and it is probably the simplest to convert. The bathroom generally has a tiled or waterproof floor which can take spills and drips with little damage and creates a minimum of dust. With a small window, it is usually



George Wright

Superimposing Intriguing effects are possible by making a combination print from two different negatives

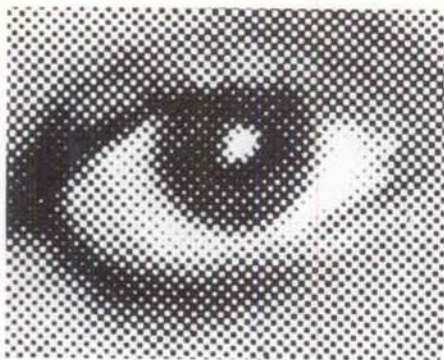
easy to make light-tight. And it has running water on tap and a drain to flush away waste water. But it can also be the most inconvenient room in the house if you prevent other members of the household from using it at the times they most want to. A lot of domestic friction may be avoided by working in a bedroom, even if it does have limitations.

Though the bedroom may not have running water, it is more likely to have a power point for the enlarger and safe-light. And there is a great deal you can do without a sink and running water. Colour enlargements, for instance, can be put in a light-tight drum and processed in the light, while all types of films are processed in lightproof developing tanks. All that you need is a room that can be completely darkened and a reasonable area for a working table and floor space.

On display You can look forward to brightening the walls of your home by mounting and displaying the results of your own processing



Peter Dazeley



Texture Effects like this are possible by copying through texture screens which you can buy or make for yourself

One disadvantage of a bedroom, however, is dust—a major nuisance in a darkroom. Faced with the prospect of prints spoiled by dust specks which have turned into huge writhing snakes under the enlarger, you might turn to the kitchen as an alternative site for a darkroom. But there are reasons why the kitchen is not a good idea.

Most important of these is the danger that chemicals might get mixed up with food preparation. Despite precautions, it is very difficult to keep all traces of chemicals away from food. While everyone appreciates that food containers should never be used for chemicals, in the kitchen there is always the danger that a bottle of, say, developer might get mistaken for something else.

A further drawback of kitchens is that they are generally designed to have large windows, which are difficult to black out, and are often in use by other members of the household.

Whether you are going to use a bedroom or bathroom, the most important step is to make a blackout screen. This must prevent all light coming through the window—even in the countryside at



Berthoule/Explorer/Vision International

economy tip



Purpose-made developer and fixer dishes (foreground) bought in the shops are relatively expensive. Trays meant for seeds or cat litter are almost as good, and are usually much cheaper.

False colour Home colour processing and printing allows you scope for stunning effects using different techniques and treatments

night there is too much—but at the same time you will want to be able to set it up and take it down easily and quickly.

A suitable frame can be made to fit snugly into the window recess. When covered with at least two thicknesses of thick black cloth or leathercloth, or possibly, heavy duty black polythene dust-bin liners, this should block out most light. An alternative that can be used with old-fashioned casement windows is a double layer of hardboard panels. One layer is slightly smaller than the other and fits neatly into the casement. The other overlaps this by a couple of centimetres or so and acts as a light tight flange. Both this and the cloth frame can be held in place by turnscrews on all four sides.

Although screens like this will usually make the room very dark, it is surprisingly difficult to achieve totally light-

proof conditions. A room that seems pitch black at first may in fact let light under the door, through a ventilation brick or even through small gaps beside the blackout screen. To test for light-tightness, put your blackout in place. After a few minutes your eyes will become accustomed to the darkness and you may begin to see traces of light creeping into the room. Wait for at least five minutes to make quite sure and trace the leaks to their source. Small leaks can easily be stopped with thick black polythene and masking tape, draught excluder or virtually anything you can lay your hands on—but it is essential to make the room totally dark if you are not to risk 'fogging' prints.

If you cannot create a darkroom like this, do not despair; you can develop both black-and-white and colour films at home simply by using a changing bag. This is a bag made of opaque fabric with two elasticated sleeves for your hands. With this bag you can load film into developing tanks or carry out any other simple job that needs darkness.

How to black out a room



1. Most window frames will take a simply made black-out screen if the recess is free of obstructions and deep enough to take the thickness of board being used. Measure to the outside edges of the recess



2. A single sheet of 12 mm chipboard is most convenient for the screen but alternative materials may be used. Mark it up and saw it to size, so it fits the recess snugly. Use opaque draught excluder for light-proofing



3. Apply draught excluder strip all round the edges of the board, leaving no gaps. Position the strips so that when the screen is in place the foam is pressed fully into contact with the window frame. Use draught excluder for blocking cracks



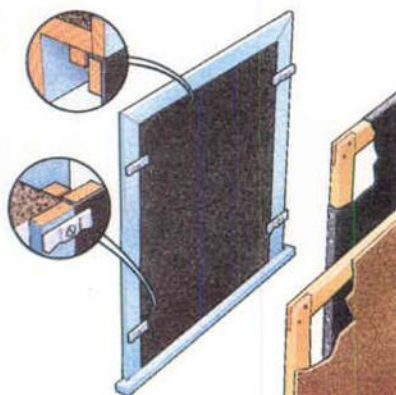
4. Position and fix catches for holding the screen in place. It is worth painting the inner and edge surfaces matt black in order to cut down light reflection and seepage. Handles are helpful for pulling the screen from its recess after use



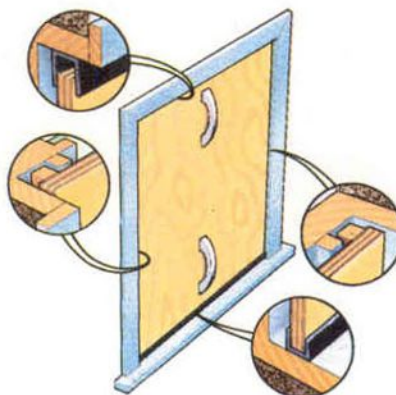
5. The final attachment of this type of catch has to be done with the screen in place so that alignment is correct. Simpler types of catch, such as turn buttons, can also be used. The edge need not butt tight against the frame



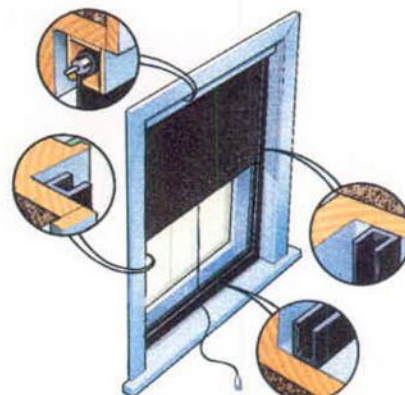
6. Except for the time taken for the paint to dry, this screen was completed in less than half an hour. An alternative method of lightproofing is to glue flaps of heavy-duty black cloth around the edges of the board



7. If the window reveal is too deep, form a recess using 25 mm battening screwed a little way in from the edge of the facing woodwork. Hardboard or opaque fabric blinds, from specialist suppliers, are an alternative to chipboard



8. You may be able to adapt certain types of double glazing kit to accept sheets of wood in place of glass. In this design the board is removed by lifting it. Additional light baffling can be provided by battens fixed to the board



9. For a permanent set-up, there is nothing more convenient than a black-out roller blind. You can use proprietary components to manufacture one to exact dimensions. Plastic channelling is suitable for light-trapping at the edges



Peter Dazeley

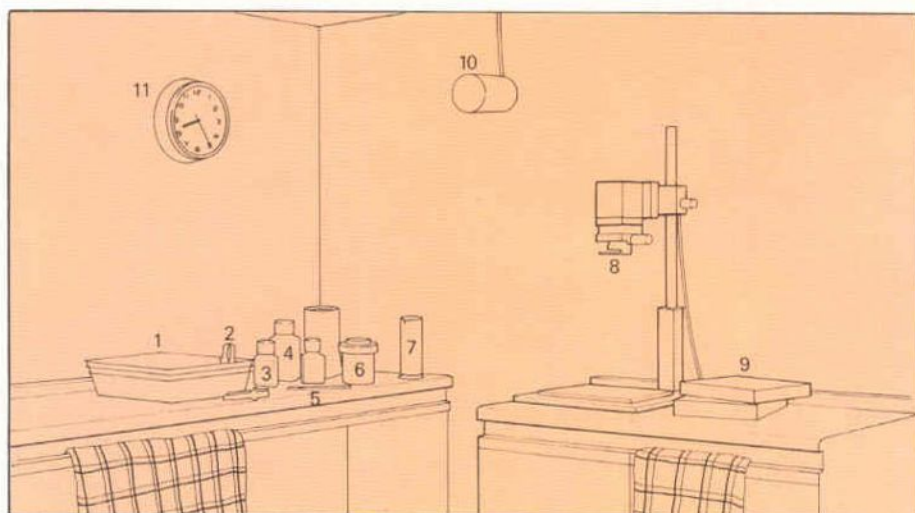
Darkroom essentials You really do not need a great deal of equipment to begin your own processing and printing. The essential items include: 1 Dishes for liquids 2 Tongs for handling prints 3 Developer 4 Fixer 5 Photographic thermometer 6 Developing tank 7 Measuring cylinder 8 Enlarger 9 Printing paper 10 Safelight 11 Clock. There are other items which you will find useful, such as a focusing aid and drying clips, but you can add these later

A straightforward process

Developing both films and prints in black and white is a relatively straightforward process. In each case the sequence of operations is the same. First, print or film goes into a developing solution that acts chemically to bring out the image. When the image has reached the correct density, the photograph is removed from the developer. Development is then arrested using a stop bath, and the photograph can then be put in a fixing solution which fixes the image and prevents it being degraded when exposed to light. Another wash removes unwanted chemicals, and the film or paper can then be dried.

Colour processing is slightly more complex, but certainly well within the capabilities of the experienced amateur.

So what is the minimum of equipment that you will need to start out your darkroom work? The major item is undoubtedly the enlarger, in terms of both cost and its value to you. A later article will deal with points to consider when buying your enlarger; experts often



Bernard Fallon

recommend getting a 'universal' model, which will handle all film sizes, but many beginners may prefer to buy a 35 mm-only enlarger, on the grounds of economy. Most modern enlargers have a drawer which will take colour filters, should you wish to do colour work, so at this stage it is probably not a good idea to buy a model with a separate 'colour head', with built-in colour filters, if economy is important to you.

You will also need a small range of print processing equipment: dishes, a thermometer, print tongs (to avoid the risk of dermatitis), a small measuring flask and a safelight. This gives a red or orange light that does not affect black-and-white paper, but it is unsuitable for colour materials which have to be

handled in complete darkness.

A clock of some kind, capable of giving you timing to the nearest second, is essential. To start with, many people are quite happy to use a watch—the illuminated digital kind are convenient.

For film processing you will need a developing tank, which allows you to process the film in the light once you have loaded it in perfect darkness.

Your basic darkroom equipment is complete once you have the chemicals—developer and fixer. It is possible to get 'universal' developer, that will handle both films and prints. It is not ideal for either but the beginner may prefer to use it, since it avoids additional complications. Most kinds of fixers are suitable for both films and papers.

Depth of field

It is rarely possible to keep all of the picture in focus, and sometimes you may not want everything pin-sharp. Careful control of depth of field can conceal ugly clutter, or draw attention to the main subject of the photograph

Put simply, depth of field means 'range of sharp focus'. The beginner generally wants to get everything in the picture in focus, but this is not always possible. There are numerous creative uses of focus, but this article is concerned solely with the technical aspects of controlling the depth of field.

The most common way to improve the depth of field is to 'stop down' the lens aperture—that is, reduce the diameter of the lens. The smaller the aperture, the better its depth of field. Remember that small apertures mean large *f*-numbers.

From this, it follows that if you want to get as much of the picture as sharp as possible, you must always close the lens right down—to *f*/16 or *f*/22 if the lens allows it. To keep the same exposure, this means that you have to give a longer shutter speed.

Once the aperture gets smaller than a few millimetres, the picture quality worsens because of the effects of *diffraction*—the result of light travelling past obstacles. The same effect is used in another way to create spikes on highlights in pictures. Many lenses can't be stopped down smaller than *f*/16, since the gain in depth of field would be offset by an overall loss in sharpness.

Another way of controlling depth of field is to use a lens of a different focal length. A

1. Light from the centre of the subject is brought to a focus at the film plane



Blurred backgrounds Using a wide aperture cuts out the background. Stopping down the lens brings it into focus

telephoto lens has a more restricted depth of field than a standard one, when focused on any particular distance, while a wide angle lens has a greater depth of field. Choice of focal length has as much effect on depth of field as choice of aperture.

How depth of field works

The only reason that a lens has any depth of field at all is that we can tolerate slightly out-of-focus images. Imagine a simple lens focused on an object, as in fig 1.

Rays of light from an object slightly closer will not be

focused exactly on the film, but will focus a little way behind it (as in fig 2) so the slightly closer object will be out of focus on the film.

But unless you enlarge the film a great deal, and look at it closely, you won't notice that the slightly closer object is blurred. The film itself has a grainy nature, which can make it impossible to tell whether or not objects are sharply focused.

These two factors combine to allow a fair tolerance in focus, and the range of sharp focus in the final picture appears to be quite wide.

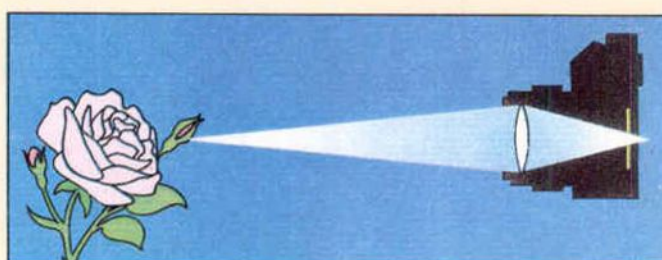
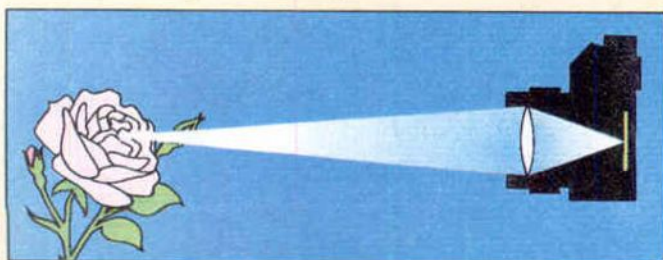
Circles of confusion

The simplest sort of object to deal with is a point of light. A slightly defocused image of a point of light is a small circle, technically known as the *circle of confusion*, rather than a point. The more defocused the image, on either side of the true focus point, the bigger the circle.

Any real object can be thought of as being made up of a large number of points of light, of different colours and brightnesses. Each point produces its own image, and when the image is out of focus all the circles of confusion start to overlap, and the result is a blur.

Stopping down the lens helps to improve the depth of field because if you reduce the lens's aperture, you reduce the size of the circles

2. Light from parts of the subject closer to the camera focuses behind the film



of confusion. So there is a greater chance that slightly out-of-focus images will be acceptably sharp, and depth of field is increased.

Depth of field scales

Many lenses have depth of field scales on their barrels, usually on either side of the focusing mark. These show how much is in focus at any particular *f*-number, read from the focusing scale.

The scale shows another characteristic of depth of field—it is greater on the far side of the focus point. This is worth bearing in mind when you are planning your exact focus point.

Never rely on the scale to give sharp results. Since depth of field depends on tolerance to unsharp images and on the graininess of film, the camera manufacturer has had to make an estimate of what people will put up with. If you are being very critical

No depth A bad choice of focus and depth of field means most flowers are blurred

and are using fine grain film, do not be surprised if you get poorer depth of field than the scale suggests. It is only a guide—remember that only one distance can be truly sharp unless you are using special equipment.

On an SLR, it is possible to see the range of focus on the viewing screen. But many cameras these days view the scene at full aperture all the time, to give a bright view and make focusing easier. On such cameras it is an advantage to have a 'depth of field preview button' which stops the lens down instantly to the taking aperture, giving you a picture of the final depth of field. Though this helps a lot, it has the drawback that the screen goes quite dark making it hard to view. Even so, it is the only sure way to check.

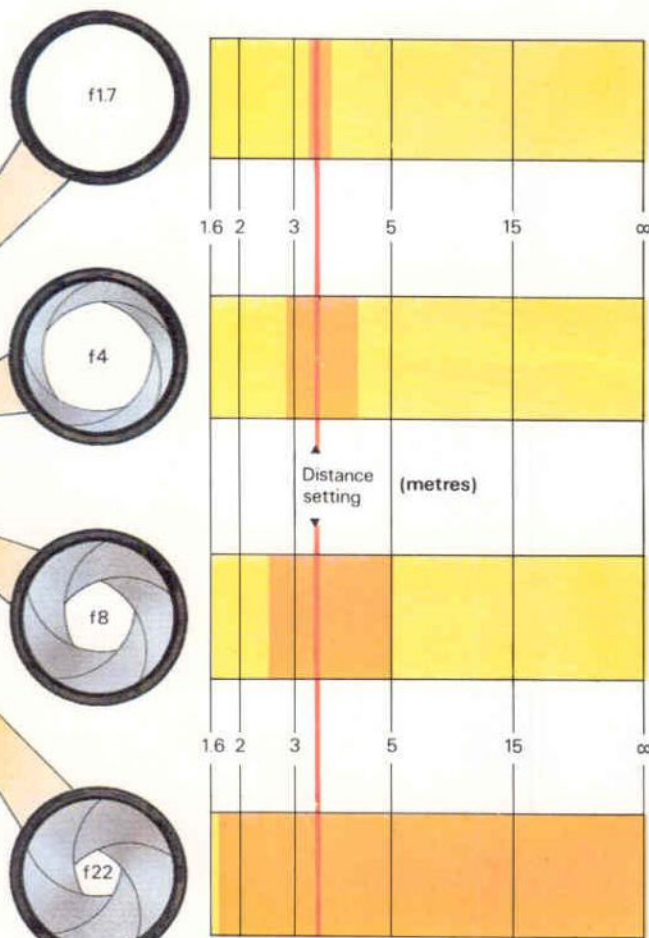


The depth of field scale

Full aperture At wide apertures there is very little depth of field, and only a small area in front of and behind the distance setting is in focus



Minimum aperture As the lens is stopped down, the depth of field becomes progressively greater. At the minimum aperture, in this case *f*/22, virtually the whole of the picture is in sharp focus, and depth of field extends to infinity





Improve your technique

Shooting into the sun

Pictures taken against the light can be spectacular. But exposure meters can mislead, and the photographer must be prepared to use some judgement. The results make the techniques worth mastering.

The advice which came with the early box cameras used to be 'have the sun behind you' to make sure that the photograph came out with all the subject evenly lit. This advice might have been safe, but it did not always produce the most exciting pictures—and taking exciting pictures, with impact and drama, is what photography is all about.

Back lighting—in other words, light coming from behind the subject, towards the camera lens—probably produces the most dramatic lighting effects of all: sun pouring through leaves, shining haloes on hair and of course the inevitable sunsets. Any slight mistiness is emphasized by shooting against the light—think of shafts of light in a smoke-filled room, for

example, which are much more obvious when looking into the light. This results from the light being scattered by small particles.

Shots against the light, whether or not the sun or light source is included in the picture, are often called by their French term of *contre jour*—literally, 'against the daylight'.





Front lighting A meter reading can be taken easily, but the result lacks depth and is generally uninspiring

When photographing against the light, the two most common types of problem—technical and visual—become more difficult to separate than usual. This is because by changing the exposure, you can create pictures which will look quite different from what the eye sees. Training yourself to look for and recognize such opportunities is a basic part of your photographic skill. For example, a shot directly into the sun can produce either a dramatic flare, or a striking silhouette, depending on the exposure.

At this point, having recognized the visual potential, the problem is to decide on the exposure which will produce the picture you have in mind. Otherwise the shot may turn out washed out, or gloomy, at either extreme.

Getting the exposure right

How you decide on the exposure depends partly on the equipment you use. Most modern 35 mm SLR cameras have an exposure meter which measures the light from the scene as you see it in the viewfinder—this is *TTL* (through the lens) metering. A number of 35 mm cameras, however, have built-in meters which measure the light separately. Most non-reflex cameras (such as the Olympus Trip) operate in this way. Some people prefer to use a separate, hand-held exposure meter, while others may have no meter at all and simply guess the exposure from experience, or use symbols on the camera. In this case, your own judgement of how much light there is will take the place of light meter readings.

The chosen exposure for an against-the-light shot is generally a compromise. When you look at a scene, your eye and brain combine to make constant adjustments between dark and light areas so you can see detail in both. Film, however, records a more limited brightness range.

In subjects with a wide contrast between highlights and shadows, it can show detail in only one or the other.

Meters usually work on the basis that the dark and light areas in a scene will balance each other out, and give an exposure which, on average, is grey. So if you want a predominantly bright or dark shot, you may have to override the meter. If you have an automatic camera, with no manual override, read the 'How to fool automatic cameras' box.

Each scene is different in its exposure requirements, so it is impossible to give rules. The lighting may vary from a shaft of sunlight in an otherwise dark room, to a brilliantly lit open shore or



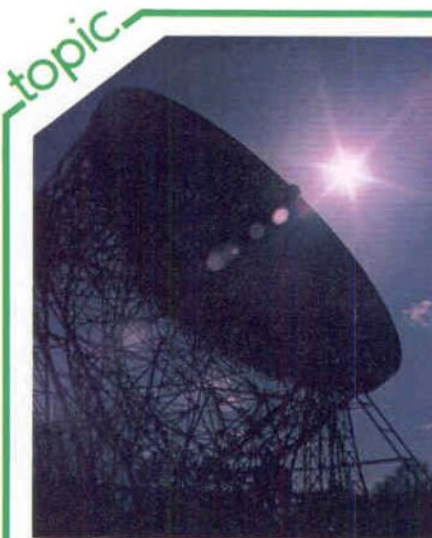
Rim lighting Shooting against the light produces a rim-lit effect that adds atmosphere to a sylvan scene

mountain background. There are, however, several guidelines which you can adapt to the different conditions you encounter.

Sunsets

Perhaps the most inviting back-lit shots of all are sunsets (or sunrises). They can be spectacularly vivid and colourful, and the foreground details are usually unimportant. A low sun can provide a bright background for silhouettes, transforming even a mundane scene into an effective picture.

While the setting sun may appear bright, it is dim compared with when it is high in the sky. Shadows are very weak,



Lens flare

How your shots into the sun turn out may depend as much on your lens as on the exposure. Modern photographic lenses have several elements—separate internal lenses—which together correct for all the

faults of simpler lenses. Zoom lenses may have 15 or more elements. Despite the latest anti-reflection coatings, light inevitably reflects between the elements, often forming ghost images of very bright lights. Sometimes these are spectacular and welcome; quite often, however, they destroy the shot.

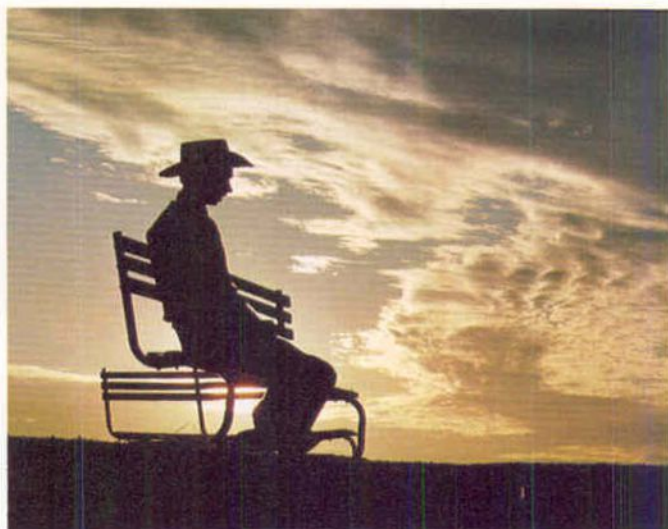
Stray light inside the lens may not even form ghosts, but instead veils the whole image, lightening the shadows. Again, this is usually unwelcome. Dust on the front surface of the lens has a similar effect. If your lens is normally protected by a filter, which has collected the dust which would otherwise have fallen on the lens, it may be worthwhile removing the filter altogether for a shot into the sun.

With an SLR, you can see these effects before taking the shot. But with viewfinder cameras you must take pot luck. The lenses of such cameras often have fewer elements than SLR lenses, so the problem may not arise to the same extent.

A lens hood, or even a strategically placed hand, can overcome some of these problems where the sun is not in the picture. With a non-SLR camera, any attempts at shielding the lens with your hand run the risk of including it in the picture.



Straight reading Here the interest centres on the colour of the hot-air balloon and the direct reading gives a good exposure



Straight reading The exposure reading given by the meter produces a striking shot with a strong silhouette

and usually one can look directly at it. So although the sun is the brightest part of the scene, it is not so brilliant as to dominate the meter completely.

When photographing sunsets, therefore, the reading given by the meter will generally produce a quite acceptable shot. If you want more detail to show up in the foreground, give slightly more exposure than shown by the meter. Half a stop extra exposure will probably be all that is needed—that is, the lens aperture is opened up slightly, to a lower *f*-number. Each *f*-number is referred to as a 'stop': on most cameras it is possible to set the aperture ring between *f*-numbers, to change the exposure by half stops. Any more than half a stop increase when photographing a sunset may lead to an overexposed, washed-out sky with

none of the subtle colouring that attracted you to it in the first place.

Bright sun

When a much brighter sun dominates the view, it is generally impossible for the film to record the wide brightness range that you can see with your eyes. The meter imagines that it is dealing with a very bright scene overall and gives a reading that exposes the sun and bright sky perfectly, but little else. Under these circumstances, your shot will probably only show silhouettes against the sky. If you deliberately overexpose in order to get shadow detail, the sun and sky will appear very bright indeed and may destroy the image you had in mind. In this case, you just have to accept the limitations of film compared with the eye

and shoot the silhouetted images or shapes to the best advantage.

A similar problem occurs when photographing reflected sun, such as on water or the windows of skyscrapers. Here, however, the key feature of the scene is the bright, sparkling light and unless you want silhouettes against well-exposed sparkles, it is probably better to overexpose the reflections, making them very bright in the final result. Again, half, or maybe a whole stop of extra exposure will usually be adequate. It is a mistake to expose to give good shadow detail, as this will give overexposed highlights.

Back lighting

There are many striking *contre jour* shots in which the sun does not appear directly, but is blotted out altogether by

How to use the meter



Black and white Exposure meters take an average brightness reading of a particular scene. In this case, half the house is black and half white. The meter exposes for mid grey with ideal results



1. In this into-the-light shot, the sun and sky dominate the view. The meter gives a reading that leaves the foreground underexposed. More exposure is needed, so first note the straight reading



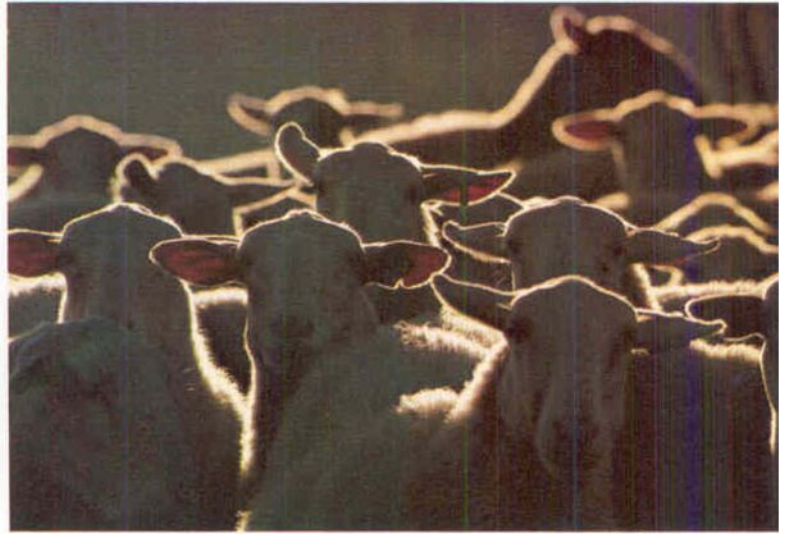
2. Exposing for the dark foreground brings out details in the shadows, but the sky is badly overexposed making the picture appear washed out. Note the meter reading for the shadow areas

Edouard Bernin/fotogram



One stop over To gain a sense of atmosphere in a back-lit shot you can deliberately overexpose by half a stop to a full stop

Jean Paul Ferrero/Ardea



One stop under A straight reading gave too much shadow detail. Deliberate underexposure gives more dramatic results

some feature.

Such pictures vary from 'rim-lit' scenes, with the sunlight outlining objects and the rest of the scene in semi-darkness, to obliquely lit buildings in which most of the scene is well-lit from the far side. The exposure meter gives readings which may range from very inaccurate, as in the dark, rim-lit case, to quite accurate, where the whole scene is well-lit.

Quite often, back-lit shots will have a bright sky and other features, and strong shadows. The direct meter reading will be dominated by the bright parts of the scene, particularly the sky, and will give an underexposed result, with the shadows very dark indeed.

When deciding on the exposure for this sort of scene, first take a straight

light reading, as described. If you use a TTL meter, note what settings the camera is on when the meter indicates the reading it wants. With a hand-held meter, point it at the scene in just the same way as you would the camera, so that it sees the same amount of sky as the camera.

Normally you would give the exposure indicated, but in this case you have to compensate for the deep shadows. So take another reading, this time pointing the meter at an area of shadow—either part of the scene which is mostly in shadow, or any other similar shadow area near to you. The exposure you want will be approximately midway between the two.

What you are doing with this technique is to arrive at a compromise exposure to get the best detail in the sky and in the shadows. With experience, you may prefer to bias the exposure one way or the other, to get a particular result.

A quicker rule-of-thumb method, if you do not have time for all this, is to give one more stop of exposure than the first indicated reading. This gives acceptable results in most cases. Here again, your exposure bias is based on an estimate, and can be changed to suit the subject and how you want it to appear.

In general, all subjects need individual assessment and this comes down to estimating whether or not the meter will be misled by particularly bright or dark areas in the scene you want to photograph. Bear in mind that parts of the picture which you feel should appear bright, such as rim-lit hair, may be overexposed while parts which should appear dark may be underexposed. There is no alternative to this if you are to try and capture the whole brightness range in the scene on film which is limited in its capability.

Incident light readings

A separate, hand-held meter is often designed to be used in two different ways. It can be pointed at the subject to give a general reading, in which case it

How to fool automatic cameras

Many cameras work out and set the exposure automatically. The more advanced models have **manual override**—a dial marked '+1, -1' and so on allows one or two stops more or less exposure.

But if your camera has no manual override, there is a simple way of fooling the camera into giving the exposure you want. Simply reset the film speed dial, so that the camera believes it contains a film of different speed and so has to give a different exposure.

So in cases where you feel the meter may underexpose because of bright sun, sky or reflections, set the dial for a slower speed of film to give the equivalent of half a stop extra exposure. If you are using 125 ASA film, set the meter to about 80 ASA or, in extreme cases, 64 ASA. If for some reason you want a slightly darker shot than the meter will produce, set the film speed to 160 or 200 ASA. The big danger is that you may forget to reset the correct speed afterwards, so the technique should be treated with care.

On cameras with cartridge loading, where the film speed is permanently set by the insertion of the cartridge, there is no easy way of overriding the exposure meter, and you will have to restrict yourself to subjects which do not require a different exposure.

tends to average out the light and dark areas (giving a 'grey' reading), just like an exposure meter built into the camera.

Alternatively, if the meter has an incident light attachment, or Invercone—a translucent cap covering the front of the meter—it is possible to obtain an incident light reading. This is done by holding the meter close to the subject to be photographed, pointing back at the camera, and measuring the light which is falling on the subject. This gives more consistent results than a general reading, because the meter is not then misled by any particularly bright or dark areas. In the case of shots into the sun, however, a simple incident light reading gives a false result, since exposure does not



3. The happy medium. With four stops between the extremes, an average of the two was used. This exposure retains detail in both the bright areas and the shadows to give the best compromise

Improve your technique

Fill in shadows *Brighten up shadow detail in a rim-lit shot with some sort of reflector such as a book or a newspaper. This brightens dark areas and produces glowing skin tones*

depend on the light falling on the subject from the direction of the camera.

To meter a back-lit scene properly using an incident light attachment, first go through the same procedure as with an ordinary or TTL meter, noting the reading in the direction of the subject. Then take a reading in the direction of the camera. The correct exposure is midway between the two.

Using simple cameras

If your camera is of the simplest type, with a fixed aperture and shutter speed, you do have to be fairly selective about what sort of back-lit scenes you photograph, keeping to those where enough light is reflected into the shadows from the sky, ground, or large, light objects such as buildings to give a reasonably bright overall scene. One useful trick is to half close your eyes, 'stopping them down' as if they were a lens, and check whether you can still see detail in the shadows; if you can, then it is likely to come out on the film.

Mundane? *Even an industrial area can produce exciting pictures with a setting sun in the scene*

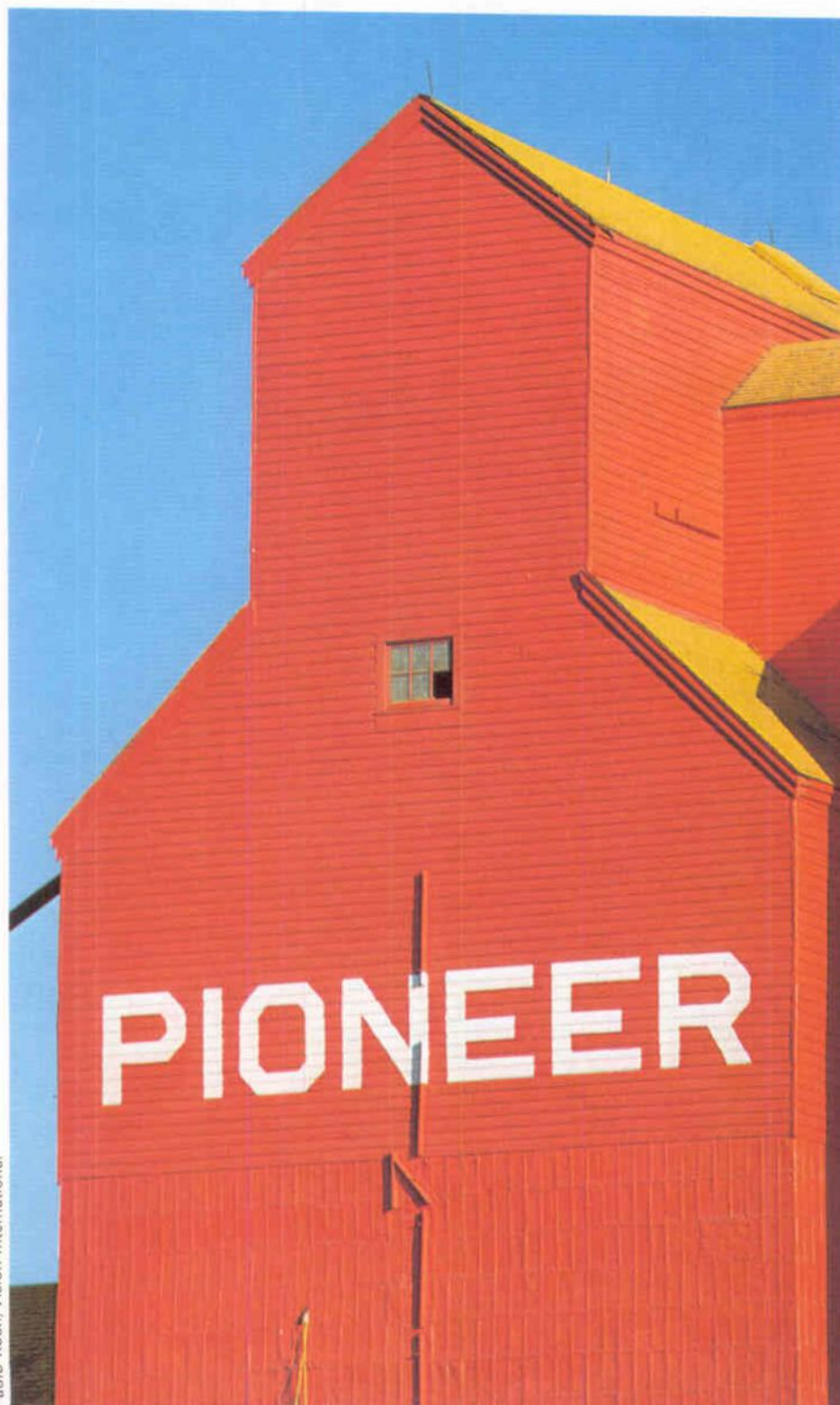




Improve your technique

Film speed

Many people use only one type of film for all their pictures, but certain subjects and certain conditions need films of particular speeds for the best possible results



Paolo Koch/Vision International

Every now and then, just as the light is fading, you come across a potentially beautiful picture—a group of children playing in the twilight under the boughs of an old tree or fishermen mending their nets in the shadow of the harbour wall—but when you check your meter, you find that there just is not enough light for the shot, even at full aperture and with as long an exposure as you can manage without a tripod.

The moment is lost, but it need not have been; with the right *speed* of film there would have been no problem. A faster film gives you that bit of extra film sensitivity to shoot in very low light. At another extreme, in bright sunlight, a slow film can be just as valuable, giving all the control over depth of focus and all the fine detail you need for a really high quality picture. Learning to use the right film speed for each situation can make a tremendous difference to the range and quality of your photographs.

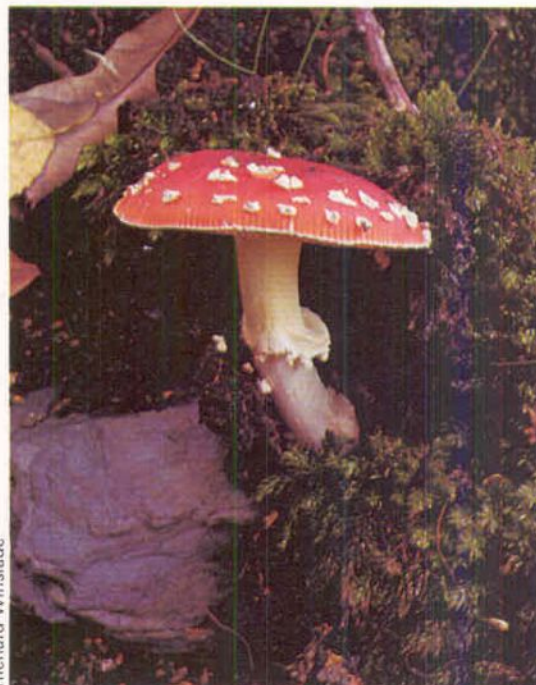
Choosing the speed

With a basic cartridge-loading camera, you have little choice of film speed—there is often just one film of each type—black and white, colour negative (for prints) and colour reversal (for transparencies). This film performs well over a remarkably wide range of conditions but there is no scope for using different film speeds for different effects. Once you graduate to a 35 mm camera, however, a wide range of films of various speeds is available and many possibilities open up.

Film speed is a property of the thin

Slow film *In bright, clear weather, use a slow film to give really full colours like those in the picture*

Fast film *When there is little light available shots like this could be impossible on anything but fast film*



Richard Winslade



coating of light sensitive *emulsion* on the film that reacts to record the image when you open the shutter. You can see the emulsion by looking along a strip of negatives. One side of the film is glossy and smooth but the emulsion side is dull and very slightly less smooth.

With a fast film, the emulsion is very sensitive and reacts rapidly to light once the shutter is opened. A slow emulsion, on the other hand, is much less sensitive and reacts slowly to record the image. In any situation, therefore, a slow film needs much more exposure than a fast film. You get this extra exposure either by increasing the aperture or using a longer shutter speed.

Alternative ratings

The speed of a film is indicated by the film speed rating marked on the package and on the cassette. Various speed rating systems have been devised, but most films are still marked with numbers according to both the ASA (American Standards Association) and the DIN (German system) standards. These ratings are established by the amount of exposure needed which in turn depends on the film's speed or sensitivity.

There is now also an ISO (International Standards Organization) rating for every film, which is identical to the ASA and DIN speeds and simply combines the two numbers. Thus a film rated 400 ASA and 27 DIN is rated ISO 400/27°.

Most people prefer to use the ASA number because it is far simpler to convert into exposure requirements. With the ASA system, the speed number is arithmetically proportional to the film's sensitivity. That is, doubling the ASA number doubles the sensitivity. If the film is twice as sensitive, it needs half the exposure. One way of halving the exposure is to double the shutter speed. Another is to halve the aperture. Because every increase in *f*-number halves the aperture, halving the exposure simply means taking down the aperture by one stop.

Fortunately, if your camera has a light meter, you won't have to make this cal-

Tone and contrast Scenes like this need a slow film to bring out the subtle tones and enhance the contrast

Black-browed albatross When using a long telephoto, fast film allows you to set a high shutter speed to avoid blur



ulation every time you change films. You simply reset the film speed dial and use the meter in the normal way.

There is a bewildering variety of films on the market, each with its own characteristics and capabilities, but they can be divided into five broad groups according to their speed: fast, very fast, medium, slow, and very slow.

Using fast film

Fast films are rated at anything from 200 ASA upwards. A particularly popular speed with all types of film—black and white, colour reversal, and colour negative—is 400 ASA.

It is in low light conditions that a fast film really pays off. With its extra sensitivity, it can allow you to shoot normally when there is not enough light available to take your picture on a standard medium speed film without very long exposures or wide apertures.

This quality is particularly valuable on dull, rainy days or in European winters where cloud and low angle sunlight reduce the amount of available light. Often the only way to continue your photographic activities throughout the year and take advantage of the abund-



Jean Paul Ferrero/Ardea

ance of highly photogenic material that occurs in winter is to use a fast film. Many of the beautiful atmospheric pictures of misty winter scenes or frosty puddles will probably have been taken on fast films. Indeed, unless you are fortunate enough to live in a climate that is sunny all the year round, it is probably a good idea to keep your camera loaded with a relatively fast film in winter.

Similarly, indoor photographs by

available light are rarely possible on standard film without extreme exposures. Usually flash or photographic lights are needed, either of which can ruin the lighting effect or spontaneous event you were trying to capture—and they cost money. By using a fast film you may not only be able to shoot indoors by available natural light during the day, but also by the normal room lights at night.

If you do shoot with a fast film in artificial light, though, remember that

Texture *On anything but a fairly slow film, the fine textural details on Ayers Rock, Australia, would be lost*

colour slide films are balanced for either natural or artificial light. If you use a daylight film in artificial (electric) light, the final photograph will have a distinct colour cast.

Another big advantage of fast films is that they allow you to use a higher shutter speed. This can be useful even when conditions are good enough for a slower film. With a fast film, the shutter can be set at 1/500 second or even 1/1000 second for freezing fast moving action, while a sufficiently wide aperture is retained for good depth of field. If you are photographing sport on anything but the brightest day, this can be invaluable.

Alternatively, you can take advantage of the higher shutter speeds available with fast films under any conditions to reduce the chances of camera shake. When using a hand-held telephoto lens in particular, you can easily get severe camera shake, but changing to a fast film may give you the extra shutter speed to avoid this becoming too obvious. A faster film may also be valuable with a long telephoto anyway because of the tiny maximum aperture.

With so many points in their favour, you may wonder why people do not

Depth of field *With a fast film, you can get good depth of field and fast shutter speeds even on a dull day*



Frank Herrmann



Medium speed film *In changeable weather load the camera with medium speed film to cope with all conditions*

shoot with fast films all the time. Indeed some photographers do. But, like every type of film, fast films do have their disadvantages.

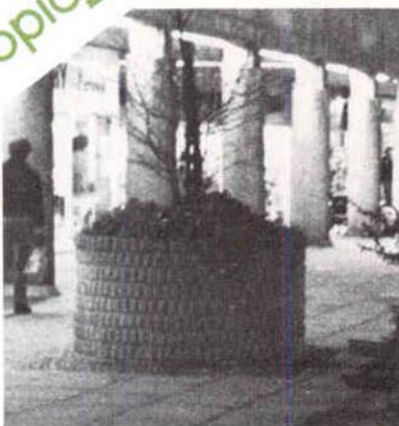
One of the most significant drawbacks of fast film is reduced picture quality. Fast films not only give a *grainier* image than slow films, but they also tend to suffer from lack of contrast.

With a grainy image, sharpness is necessarily poor because outlines are coarse and less well-defined. Study an enprint made from a fast film through a magnifying glass and you can see what appears to be the individual grains—though in fact the effect is caused by the clumping of individual grains.

If you only intend to make small prints from the negative, this extra graininess does not really matter. However, as the picture is progressively enlarged, the grain pattern and poor definition become more and more obvious. So if you want really large prints, it might be better to use a slower film if at all possible. With really fast conventional film (see panel), the grains can be so big that they are easily visible to the naked eye even at fairly small enlargements. Such coarse grain can sometimes be used creatively and even heightened deliberately for special effects, but the reduced image quality is generally undesirable.

Similarly, the softness of the slightly lower contrast negative of high speed

topic

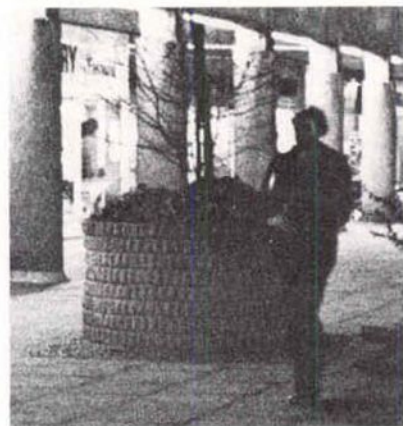


Very fast films

Sometimes, when the light is very poor, you may find that a standard fast film is inadequate. In this case you could use one of the special high speed black and white films that are available. These can be rated at 1600 ASA or above.

Although 1600 ASA sounds very fast, it is only worth two more stops than a standard fast film like HP5. A 1600 ASA film, therefore, will not enable you to take pictures in very dark conditions, such as a dimly lit road at night. But it may give you the extra latitude to shoot at the aperture or shutter speed you want, or to use a telephoto lens in gloomy conditions.

There are two basic groups of very high speed black and white film: conventional films and 'chromogenic' films. Conventional very fast films such as Kodak 2475 professional recording film give very



grey and grainy results when rated at 1600 ASA. An alternative is to use a slower film such as HP5 or Tri-X and 'uprate' it by increasing the development time. This tends to give burnt out highlights with lost shadow detail. The left-hand picture was taken on HP5, which is nominally 400 ASA, developed to give 1600 ASA.

Chromogenic films such as Ilford XP1 and Agfapan Vario-XL, on the other hand, work in a different way from conventional emulsions and can be rated at anything between 400 and 1600 ASA. At their rated speed they can give excellent performance, with much finer grain than a conventional very high speed film.

Chromogenic films are, however, more expensive than conventional ones and require more complex processing.

The picture on the right was taken on Ilford XP1, also rated at 1600 ASA.

John Heseltine

films can sometimes be attractive, but it certainly reduces their usability. Where there is little natural contrast in your subject, such as in a landscape on a wet day, you should use a slow film if possible to bring out what contrast there is. High speed colour films also tend to give slightly less than the full value to colours, and for really strong colour saturation, a slow film is necessary.

While fast black-and-white films suffer from lack of definition, however, there is hardly any difference in sharpness between the standard and fast emulsions of many colour negative films, though there are no colour films anything like as fast as the fastest black-and-whites. Unfortunately, colour films are generally much less sharp than their black-and-white counterparts in the first place, since colour emulsions are made from a sandwich of three layers. Each layer has its own grain structure and these tend to overlap and diffuse the final image reducing its sharpness.

Fine grain

Nevertheless, for really high quality work in both black-and-white and colour, particularly if the picture is going to be much enlarged or reproduced, a slow film with fine grain and high contrast is essential. Unfortunately, because such films are less sensitive, they need either a great deal of exposure or bright light.

Most of the high quality still life pictures used for large colour advertisements are taken on slow, very fine grain film. The extra exposure is usually obtained not by opening the aperture wide, since this might reduce depth of field too drastically, but by using very long exposure times. For this, a tripod is absolutely essential. Any still life is probably best done in this way if you want high quality results. The process requires some time and effort, but the final picture should justify all the work.

Out of doors, stationary well-lit subjects with subtle shades of colour, minute details or interesting textural qualities benefit from the superb colour saturation and fine definition of a slow film. In fact, wherever conditions are bright enough to permit the use of slow film without excessive loss of depth of field through use of wide apertures, then a slow film is best for really high quality results. In bright Mediterranean or Alpine summers, a slow film such as a 25 ASA Kodachrome can be ideal.

Pictures of flowers for gardening catalogues, landscapes for travel brochures and architectural shots are generally taken on slow film. Sometimes a tripod may be needed if apertures are to be narrow enough to give good depth of field, but in brilliant sunshine there will usually be enough light to give both narrow apertures and high shutter speed.

In fact, in bright sunshine, anything but a very slow film may not give you the degree of flexibility you want. In bright sunshine, a fast film will always have to be exposed with high shutter speeds and narrow apertures if it is not



Eve Arnold/Magnum Photos

Available light indoors *Fast film may enable you to get candid shots indoors where light levels are generally low*

to be overexposed. Indeed, it may not even be possible to stop down sufficiently to avoid overexposure. A narrow aperture ensures that everything is in focus whether you want it to be or not; you cannot keep the background out of focus to avoid distracting from your subject. Neither can you avoid freezing any motion if you have a high shutter speed. So in certain circumstances, the creative possibilities might be greater with a slow film than a fast.

It would be nice if there were a film which could combine all the advantages of both fast and slow films. Of course this is not possible and you have to commit yourself to either one or the other when you load the camera. Medium speed films combine some of the advantages of both slow and fast films with some of the disadvantages. They are not ideal compromises by any means and each film

should only be used in the appropriate circumstances.

Medium speed films are best for a wide range of photographs in all conditions. They will not work in extremely low light, but neither will they have the graininess of a fast film. Medium speed films, particularly black-and-white are ideal for portraits. Even the most beautiful complexion has minor blemishes and a slow, fine grain film shows every single one. A medium speed film provides sufficient graininess to disguise these blemishes while retaining enough contrast and definition to record all the textural definition that is wanted.

Whatever result you want, though, you should choose your film to suit the photograph you are looking for. Whether you want the fine detail of a slow film, the value of a fast film in low light, or the versatility of a medium speed film, you should load your camera with the film that gives the best results in the conditions you are most likely to encounter during your photography.



Develop it yourself

Developing your own films can give you first class results—and the process is simple and needs surprisingly little equipment. The secret of early success is to establish a repeatable routine

Developing your own films is like learning to swim as a child. Before you can achieve any good results, you have to get your confidence. Inevitably, the first results are not of the finest quality, but you will quickly build up expertise. Eventually you will be able to tackle any processing job, in black and white or in colour.

There are several good reasons for processing your own films. By doing the job yourself, you can get same-day results, and have total control over the

process, so other people's mistakes will not damage your films. After a little practice with elementary processing, you can use variations in development to compensate for low subject lighting or low contrast. This will give better results than a commercial processor could produce. And, if you process fairly regularly, home processing is considerably cheaper than having it done outside.

It is best to begin with black and white developing. Although it is perfectly

possible to start colour work straight away, the process has far less margin for error, and it is best to master the basic techniques using comparatively low-cost black and white materials which give good results in their own right.

In this article, we describe the basic process of developing black and white films, with step-by-step instructions to help you to master one of the basics of darkroom work—although surprisingly enough you do not need a proper darkroom to do it in.

Equipment You do not need a great deal to process black & white film, but it is important to get a good quality developing tank and a thermometer specifically intended for photographic use. Chemicals in liquid concentrate form are easily diluted to make up working strength process solutions, and you need an accurate measure to do the job properly. Fixer can be reused, so provide a suitable storage container—a dark glass bottle is ideal. A funnel can be a useful aid with certain types of developing tank but is by no means essential. Many of the chemicals employed in photography contain ingredients which can irritate sensitive skin: wearing rubber gloves can prevent problems of this sort

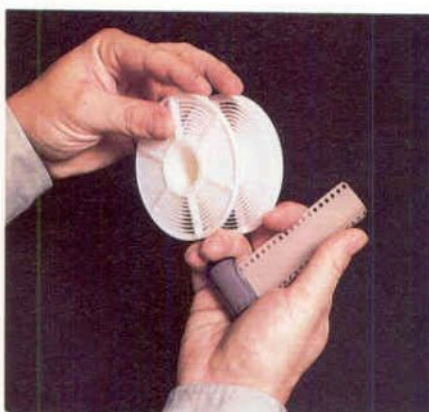


Peter Dazeley

Loading a self loading spiral



1. In complete darkness remove the spool of film from its cassette carefully (see panel below). Run a forefinger along one edge of the film and the thumb along the other and use these as cutting guides



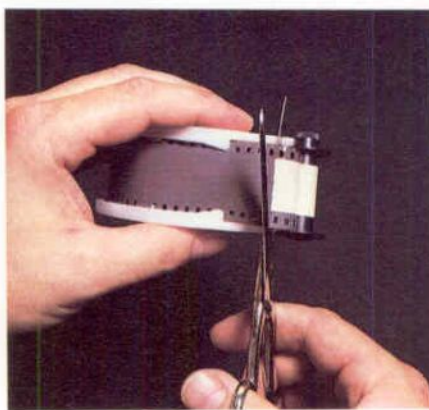
2. With one hand locate the groove opening lugs at the start of the self-load mechanism of the spiral. It helps if the spiral is correctly oriented before the light is switched off. Hold the film firmly, but by its edges, in the palm of your hand



3. Push the film end firmly into the groove beneath the opening lugs, so it safely engages the self-load mechanism (usually a ballbearing or ratchet arrangement). Continue pushing the film into the spiral until you feel it take up



4. When you are certain that take-up is satisfactory, rock the two sides of the spiral alternately backwards and forwards. Take up should be smooth and require little effort—a dirty or damp spiral can cause considerable difficulties



5. When you reach the end of the film, run opened scissors up against the spool and carefully snip this away. If you can, retrieve the spool, remove the fixing tape and use this to tape down the loose end of the film on the spiral

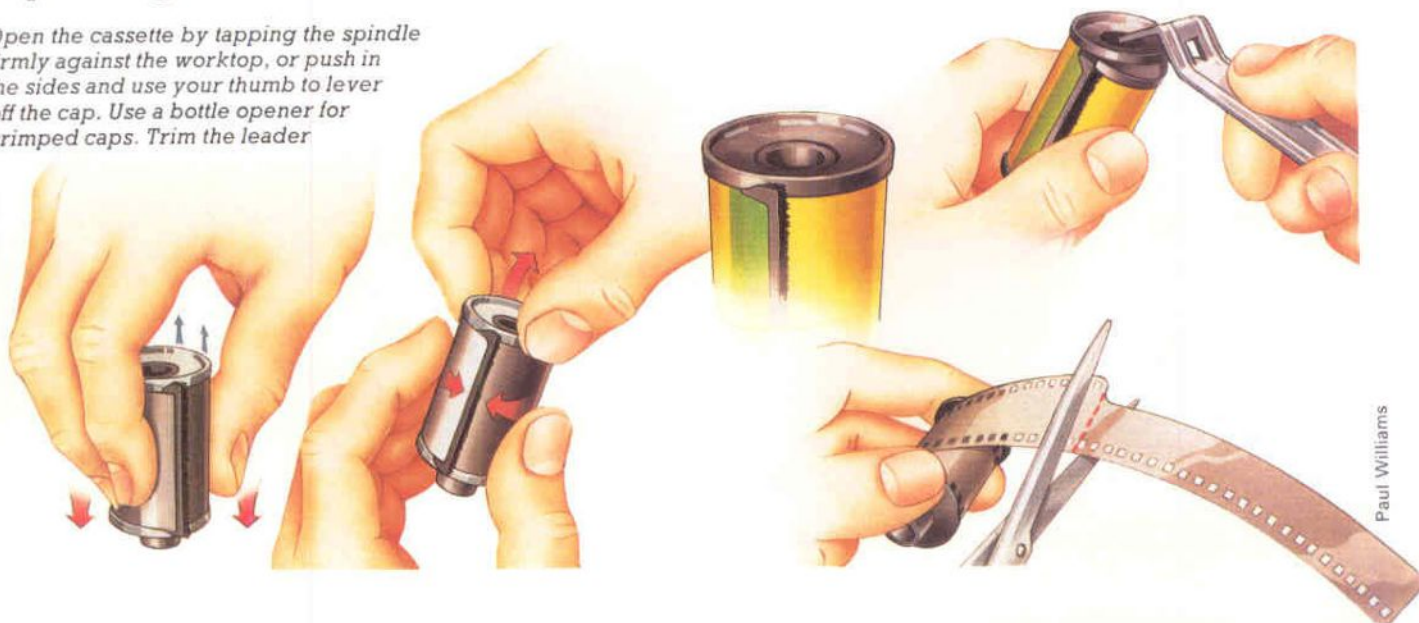


6. Carefully reassemble the components of the tank. Normally this means placing the spiral on to a centre spindle before loading it in the tank. To engage a screw lid properly, turn the lid anti-clockwise briefly before tightening

Jon Bouchier

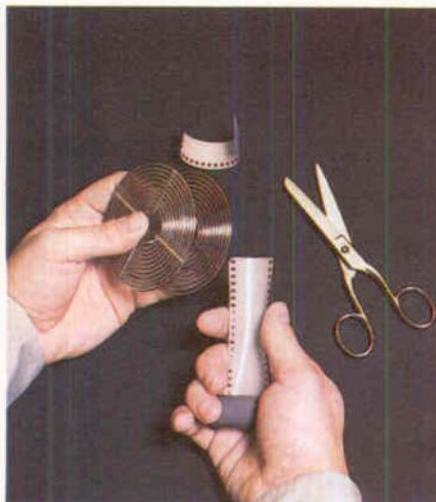
Opening a cassette

Open the cassette by tapping the spindle firmly against the worktop, or push in the sides and use your thumb to lever off the cap. Use a bottle opener for crimped caps. Trim the leader



Paul Williams

Loading a centre-loading spiral



1. A centre-loading spiral requires a slightly different approach. Remove the leader as before. Correctly orient the spiral in one hand and hold the film firmly in the other, so that it adopts a 'U' section prior to loading. This is so the film enters the grooves easily



2. Various methods are used for anchoring the film to the hub of the spindle. This spiral has a sprung wire clip. Force the film end home beneath this, or hook the end on the lugs provided. Give a firm tug to see that film is properly anchored



3. Good technique is especially important when loading a centre-load spiral. The first part of each cycle of movement is to draw out a short length of film from the spool safely contained in the palm of your hand. Maintain the 'U' section at all times,



4. The second part of the cycle is to twist the spiral round, in the process taking up the free length of film. In effect, the spiral moves towards a static film spool, in a sort of 'bending' or 'breaking' movement of the hands. When you reach the film end, remove the spool

What is involved

First you must remove the film from its cassette and load it on to the developing tank spiral, as described separately. This is the only part of the operation that has to be done in total darkness—the slightest glimmer of light on the film at this stage will ruin it. If necessary, wait until night time. Once the film is in the spiral and has been returned to the tank and the lid screwed on, you can switch on the light and pour the developer into the tank. The rest of the process can be carried out in the light, as long

as the tank remains sealed. After a specific period, you pour out the developer and rinse the tank with water at 20°C. Fix is then poured in and left for a few minutes. The final stage is to wash the film thoroughly, remove it from the reel and hang it up to dry. Step-by-step instructions on the following pages give more details of the process.

Essential equipment

You need little basic equipment—the accompanying checklist gives the essentials. Other items can be added later.

You need an area of total darkness in which to take the film out of the cassette, feed it on to the spiral reel and then place it in the light-tight developing tank. You will need to practise this technique in the light with your eyes closed before doing it in the dark. When practising, use an unimportant strip of film.

Measuring cylinders or beakers, with the quantities marked off on the side are available in stainless steel, glass or plastic. The clear plastic variety, with a lip for easy pouring, is cheapest and is reasonably hard-wearing. Always measure out your quantities as accurately as possible.

Three thin plastic containers (beakers from any kitchenware department) are needed for holding the developer, water rinse and fixer, while you are working. Label them '1', '2' and '3', so that you know which is which after you have poured in the liquids. Make sure these containers are not mistaken for normal kitchenware, and store them well out of harm's way.

They can be all kept at the same temperature by standing them in a bowl of water at 20°C. A plastic funnel is useful for pouring the liquids into the tank. Keep your darkroom equipment separate from ordinary kitchen equipment.

A developing tank is a 'must'. Tanks are made either of black plastic material or of stainless steel. The former variety is cheaper, but the latter is more robust and conducts heat very well, making it much easier to maintain the developer temperature at 20°C (68°F).

There is a wide range of developers for films on the market—some are sold in liquid form, others as powders that have to be made up with water in accordance with the manufacturer's instructions. But to begin with, you may prefer to buy a 'universal' developer. This is a ready-mixed concentrate which has only to be diluted with warm water (20°C) before use. It has the added attraction that it can be used as a print developer as well (hence its name). Particularly if economy is important, perfect your developing techniques with one developer before experimenting with other kinds.

Checklist

You will need:

- Working area that can be temporarily blacked out, or a changing bag
- Developing tank
- Developer, fixer
- Scissors and towel
- Photographic thermometer
- Timer or watch with seconds hand
- Measuring beaker
- Plastic containers for chemicals or water bath. A funnel is useful

Processing a black and white film



1. Start any processing sequence by first loading the film. Then mix the process chemicals. Bring these all to the same temperature by using a water bath. The normal temperature for b & w is standardized at 20°C/68°F



2. Check the developer temperature just before beginning the process. Use a funnel to pour it quickly into the tank, holding the tank at a slight angle (increase this to 45° if a funnel is not used). Start timing the development



3. When all the developer has been poured in to the tank, fit the cap and then tap the base sharply on the work top. This dislodges air bubbles which may have formed on the film surface and so helps prevent uneven development



4. Straight away up-end the tank two or three times. This inversion agitation is repeated once every half minute for the remaining development time. Tap the tank base afterwards. Standardize your agitation procedure to ensure development consistency



5. A minute or so into development remove the cap and check the actual working temperature of the developer (it can be affected by a tank which is unduly hot or cold). Make adjustments to development time for other temperatures



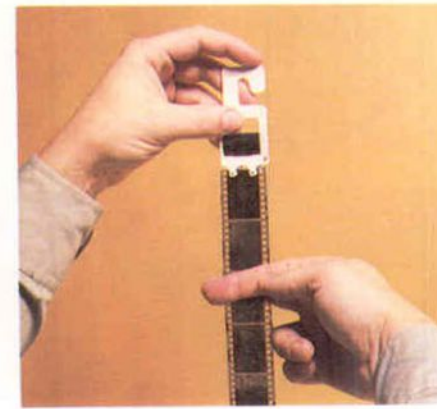
6. At the end of development, pour away the used developer and replace this with the water rinse. Although this step is optional, it helps arrest development and also lessens the degree of fixer exhaustion. Agitate the tank continually for one minute and discard the rinse



7. Pour in the fixer solution, replace the cap and agitate for the first minute of the fixing period. Make sure you never use over-worked fixer. At the end of the fixing period (which depends on the type of fixer used) pour it off



8. Wash the film thoroughly for half an hour. If you are working away from running water, start the wash using water from the water bath. This can also be used to precede washing under a cold running tap



9. Hang the film to dry in a warm and dust-free place. You can use special film clips or improvise—but keep the film taut. Wipe away excessive surface moisture with your fingers, dampened slightly beforehand, as shown

Lenses and apertures

One of the most important controls on any camera is the lens aperture. To take fullest advantage of the camera's potential, it is worth finding out how the aperture works

To the newcomer, photography seems to be a world of numbers. There are focal lengths, *f*-numbers, focusing distances, film speeds, shutter speeds... not to mention the often intricate designs for camera models.

These days, auto-exposure cameras make it possible to disregard the technicalities and still get good pictures. But the numbers remain, and to get the most from your camera it pays to be able to understand what they mean.

The *f*-numbers seem the most arbitrary set of all: they run 2, 2.8, 4, 5.6, 8, 11, 16... around the barrel of a lens. There seems no logic to them at first—they are not an obvious series, since they contain such oddities as 2.8

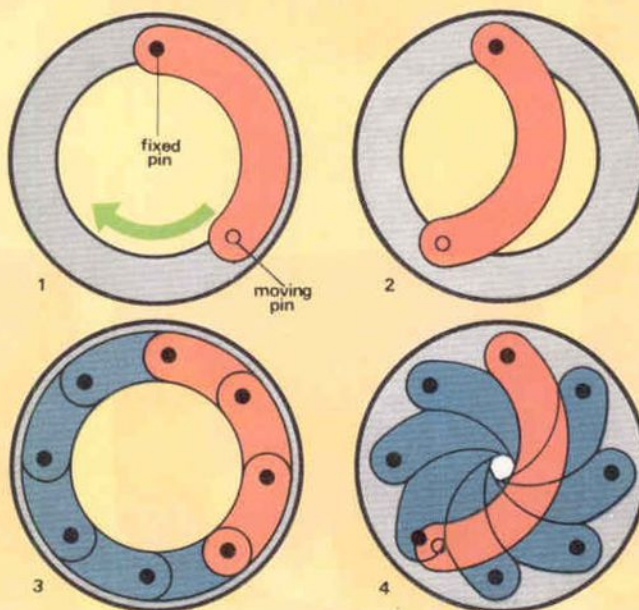
and 5.6. There is a good reason for their choice, but the most important thing is that they are a distinctive set of numbers. Any photographer picking up a new camera or lens can recognize them for what they are, so there is little risk that they will be confused with, for example, the focusing scale.

What the numbers mean

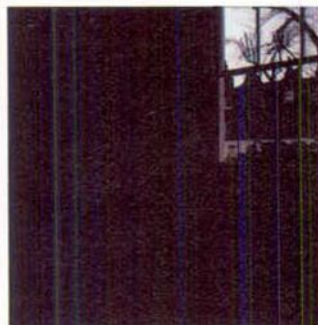
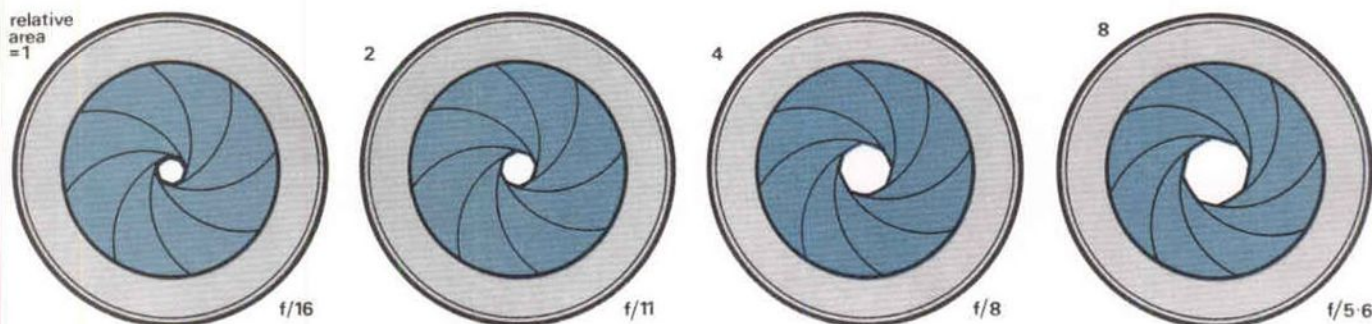
The *f*-numbers describe the aperture of the lens—that is, the diameter of the lens opening. Most lenses used in photography have a variable aperture, controlled by means of the iris diaphragm, which has become a symbol for photography. The numbers refer to the aperture of the lens at various iris settings.

It is easy to appreciate that the larger the aperture, the more light is let on to the film. So why not simply describe apertures in, say, millimetres? Then a small aperture would be 2 mm and

Diaphragm blades An iris diaphragm has many blades, each of which moves across the lens opening. One end of each is fixed, the other is attached to a short slot in a ring. Turning this ring moves the blades



Using aperture to control exposure



At *f*/16, the whole image is much too dark



The view outside is correctly exposed at *f*/11



There is a little detail visible indoors by *f*/8



The best picture is produced by using an aperture of *f*/5.6

a large one perhaps 25 mm—a scale which gets larger as the aperture does, compared with the f -number scale which, confusingly, runs the opposite way.

The problem is that we are not so much concerned with the amount of light passing through the lens as the actual brightness of the image. This depends not only on the size of the aperture through which the light passes, but also on the focal length of the lens you are using.

The focal length of a lens—broadly speaking, the distance from the lens to the film—gives an indication to the photographer of the size that the image of the subject is going to appear on the film. A lens with a long focal length—often called a telephoto lens—produces an image which is bigger than that formed by a standard lens. Conversely, a short focal length lens, that is to say, a wide angle lens, gives an image that is actually reduced in size.

The focal length of the lens, measured in millimetres, is engraved on the front of the barrel. It tells you how far the glass elements of the lens must be placed from the film in order to form an image of distant objects. This is why

Stopping down The job of the iris diaphragm is to reduce the effective aperture of a lens. The upper diagram shows the lens at a wide aperture, about $f/2.8$.

Reducing the aperture narrows the 'cone' of light, and when the lens is at $f/16$ it forms a very dim image

telephoto lenses are physically longer than standard lenses: the lens elements have to be moved farther from the film.

Since the image formed by a long focus lens is larger than that formed by a standard lens, light from one part of the subject is spread over a larger area when the long focus lens is in use, and is therefore much dimmer. This means that if both lenses have an aperture that is equally wide, the long focus lens will form an image that is larger but less bright.

Calculating the numbers

This is why photographers use the scale of f -numbers. These take the focal length into account so that the image brightness for a given subject is always the same at any particular f -number—at least in theory.

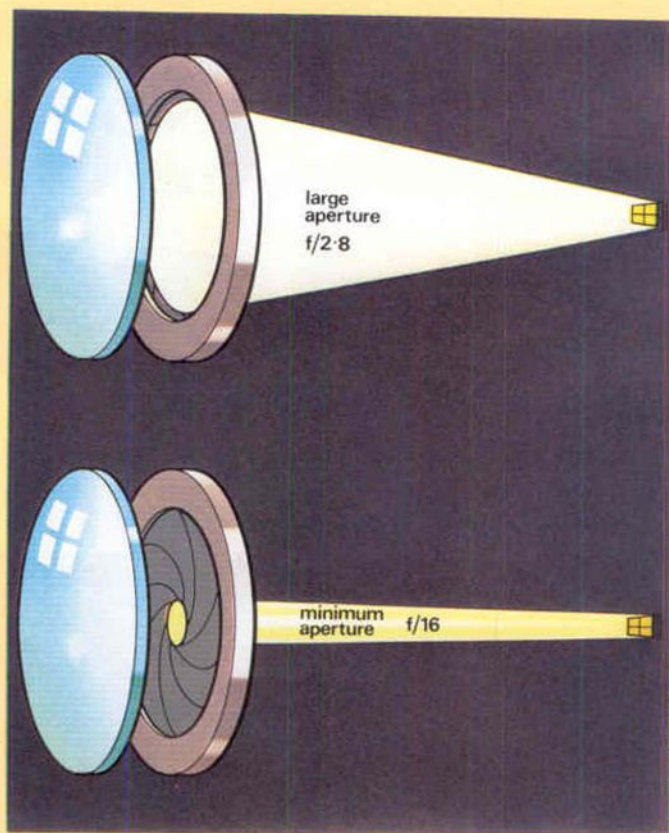
An f -number of a lens is

simply its focal length divided by its aperture. For instance, a lens of 50 mm focal length with an aperture of 25 mm has an f -number of 2, written $f/2$. Move the iris so as to reduce the aperture to

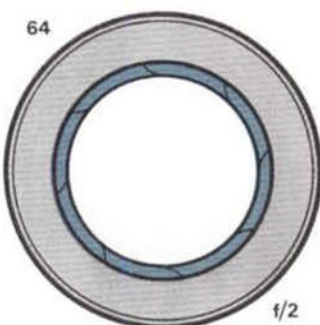
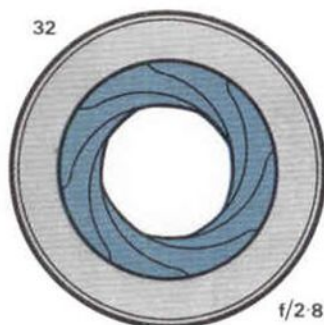
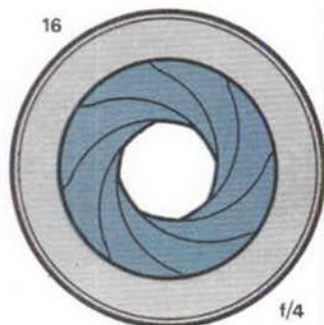
12.5 mm and it is working at $f/4$. Stop it down still further to 3 mm and it is approximately $f/16$.

When using a lens, the most helpful scale is one that shows changes by a factor of two—that is, with the image brightness doubling or halving. This means that the clear area of the lens doubles or halves. Since area changes with the square of the diameter of the lens, the f -numbers are actually the square roots of the numbers in the two-times table. Take the numbers 1, 2, 4, 8, 16, 32, 64... and work out their square roots. You get 1.000, 1.414, 2, 2.828, 4, 5.657, 8, 11.314, 16... These numbers are rounded off to give the familiar series, except that strictly speaking 5.657 is closer to 5.7 than 5.6. So there is logic in the series—each setting is a halving in area of the previous one. It is unfortunate that the series runs the 'wrong' way, and that the numbers seem a little arbitrary. But they are universal and distinctive, and mean a lot.

Exposure control Opening the diaphragm by one stop doubles the area of the aperture, and lets twice as much light reach the film. These pictures show the effect this has on exposure



Advertising Arts



Even at $f/4$ the picture is just about acceptable



At $f/2.8$ the image is quite clearly overexposed



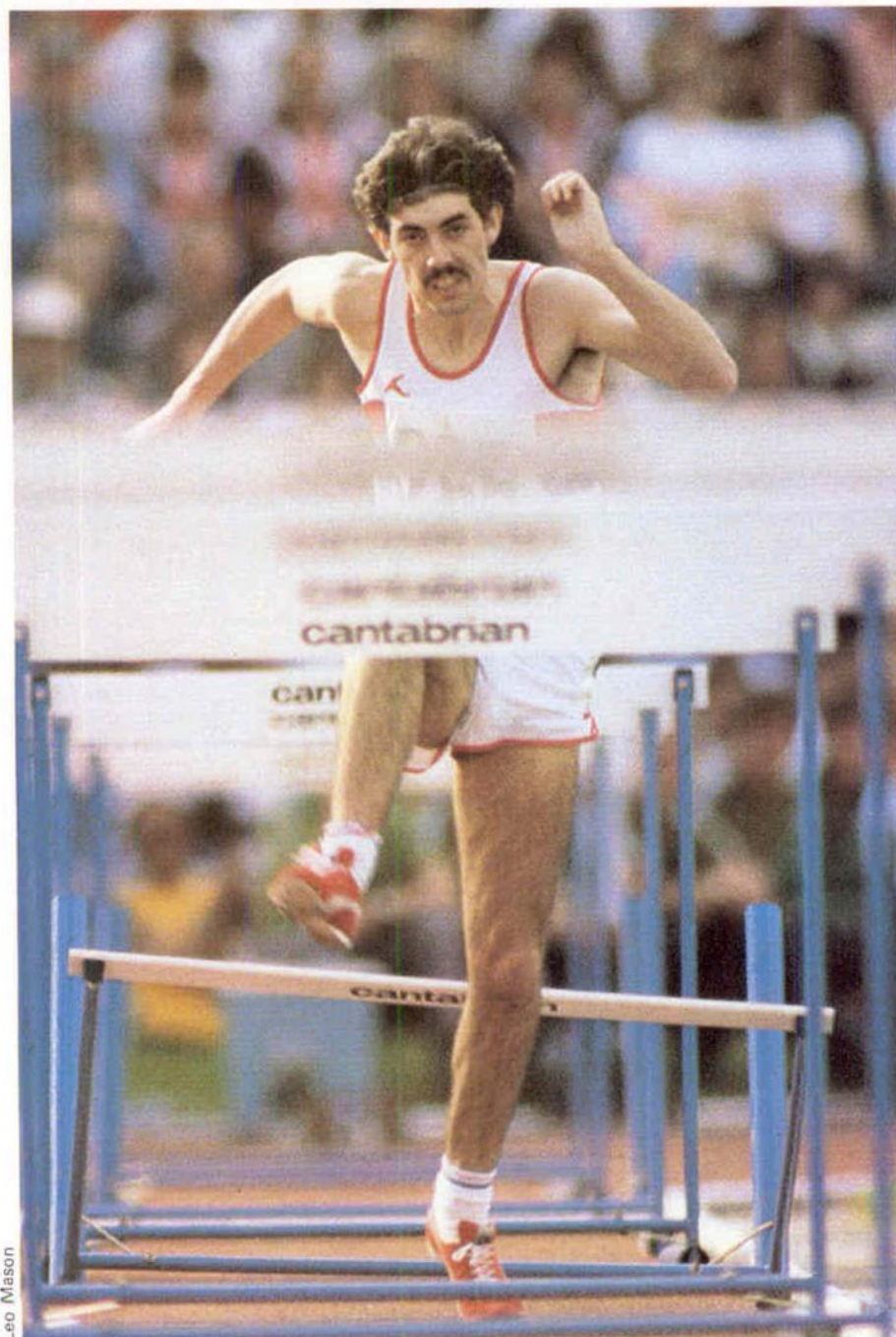
At full aperture, the picture is totally useless



Creative approach

Outdoor sport

Photographing sport can be hard work—you can sit for hours for one shot—but once you develop an eye for action the rewards amply justify the effort



Leo Mason

Few subjects provide a greater range of photogenic material than sport. Action and drama, atmosphere and colour—sport has it all. Whatever type of picture you want to take, a sporting event seems to offer a wealth of possibilities.

Action is there in abundance—the athlete sprinting for the ribbon, the burly forward powering his way out of a ruck—but there are many other photographic opportunities. If you want pictures of human drama, for instance, what better place to look than on the sports field?

If you are simply looking for attractive pictures, there is endless potential in the grace of the gymnast or the sparkle and colour of windsurfing. And when there is little happening on the field of play there are usually plenty of fascinating shots to be found in the crowd.

So where do you go to take good sports photos? Good pictures can be taken anywhere, at any sporting event, and it requires the skill of the photographer to seek them out. Nevertheless, some sports are much easier to photograph than others.

Looking for action

Any sport where there is plenty of natural action makes an excellent starting point for the budding sports photographer. Rugby's heaving scrums, crushing tackles and flying touch-downs provide plenty of scope for action shots. Tennis and football provide similarly good opportunities. And if you are able to get there, you can hardly go wrong with an Alpine skiing event for subject matter, with its high speed twists and turns, dramatic take-offs and spectacular falls. Although the vast expanse of snow presents a number of technical problems with exposure, these are easily overcome by careful positioning and judicious use of a light meter. Basically, though, any sport with plenty of large scale moments makes a good subject.

Where action is slow or small scale, however, exciting pictures can be difficult to find. Cricket might seem to be the obvious example, and certainly it is not an easy sport to cover, but there are many shots to be had in the bowler's run-up and delivery, and, because much of the action takes place in the same position every time, the camera can always be ready to fire at the right moment. While cricket may be slow moving for television, the photographer with the still camera can isolate the sporadic moment of high drama to create surprisingly lively pictures.

Getting exciting pictures from golf or swimming, on the other hand, is a real challenge. If you watch golf regularly you may have noticed that photographers never press the shutter until after the golfer hits the ball—otherwise the sound of a hundred shutters clicking

Pulling for focus For shots like this, with crowd and hurdles nicely blurred, you must 'pull' the focus carefully to keep the moving athlete sharp



Leo Mason

simultaneously might put him off his stroke. In the normal course of events, then, there are little more than three basic golfing action shots—the follow-through on the tee shot, down on the fairway and in the bunker. It is possible to get good golfing shots, but it is far from easy.

Good swimming pictures are possibly even harder to come by since much of the action takes place below water—often all you can see is a slow moving head hidden beneath a black bathing cap. Certainly a row of swimmers plunging into the water at the start of a race can be spectacular, but everyone else shoots at the same moment!

Choose a sport with plenty of movement at first, and move on to the more awkward subjects when you have some experience behind you, unless you have a particular interest in an event.

Personal interest is certainly a big

advantage because, if you know the game well, you will have a good idea where to stand to capture the heart of the action and you will know when to expect dramatic moments. If you know little about the sport you intend shooting, read up about it before the day. No more than a basic working knowledge is necessary—any more can lead to a tendency to take only obviously predictable shots.

Pro v. amateur

The glamour of professional sport acts like a magnet to photographers, and at any major event dozens of hopeful cameramen, both professional and amateur, are to be seen waiting around for the big moment. With so much competition, the chances of getting a good position to shoot from are not very high—even the professionals have problems. Most big venues have limits on the

Shooting football *With the grandstand out of focus, this superbly caught peak-of-the-action shot comes across strongly*

numbers of photographers they allow on the field and the chances of an amateur being given permission to sit on the pitch during a major football match or on the Centre Court at Wimbledon are extremely small.

Yet while the big names of sport make the headlines, they do not necessarily make good photographs. A tiny figure in the corner of the frame against a distracting background does not make a very exciting picture, even if the figure is a superstar—there are already thousands of bad pictures of any major personality. It is far better to get a good position at an amateur event than a bad position at a big professional game.

Many of the great sports pictures of history have been shot by amateurs at obscure events. There is always scope for pictures wherever you are. Because it is live action, there is always a chance of something unexpected happening whether you are at a Saturday kick-around or the Cup Final, and it is the element of surprise that makes sports photography exciting.

When it comes to the ideal range of equipment for sports photography no two people agree, because different situations require different treatment. At a tennis match, for instance, professionals shooting from the courtside tend to use a 135 mm lens for whole body shots up to the net and anything between 180 mm and 300 mm for baseline

Winter sports *With plenty of light, bright colours and an abundance of dramatic action, ski events offer tremendous scope for the photographer*



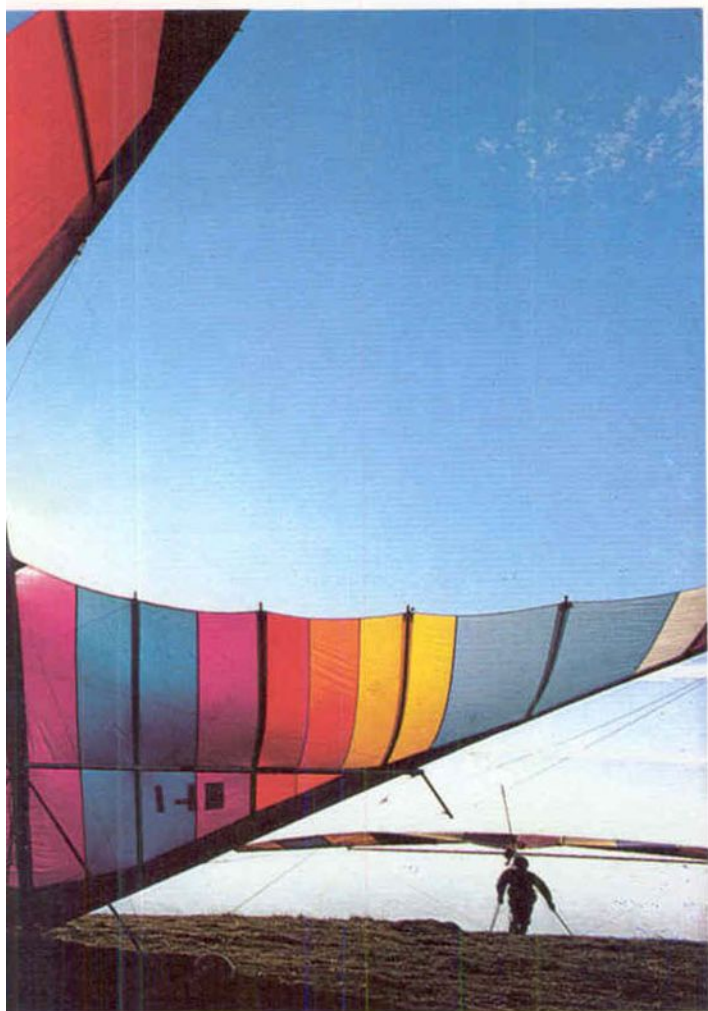
Stewart Fraser/Coloursport



Rowing Although fast action often needs rapid shutter speeds to stop movement, a slow shutter speed can blur the image to suggest pace very effectively

Hang gliders With so much colour and sparkle, sports like hang gliding make ideal subjects, but remember colour must be composed into a balanced picture





Downfall of a cyclist Sport is full of humour—keep your finger on the shutter ready for moments like this as well as the more obvious highspots

Windsurfing It is worth going to considerable lengths to get a good position to shoot from—here the photographer hired a boat



Leo Mason

Tennis Up to the net volleys in tennis often provide dramatic moments. Look for signs of effort as the player returns—or fails to return—the ball



Leo Mason



Creating drama Without thoughtful composition, the intense drama of the sports field can often be lost. While both of these pictures are pleasing, that on

rallies. At a football match their choice would be completely different. Then, unfortunately, most amateurs do not have such freedom of choice.

You can get good results with virtually any camera and standard lens, given the right conditions, but probably the best combination is a basic 35 mm SLR with a 200 mm telephoto. The advantages of the telephoto over the standard lens are quite significant. A telephoto allows you to single out the interesting areas and blur out background distractions by



the left has more tension because the front runners, closer to the leading edge of the frame, seem to be straining to get out of the picture

differential focusing. But above all it moves you right into the heart of the action so that you fill the frame with your subject. Anything bigger than 200 mm, though, would be unwieldy and difficult to use.

A zoom lens might seem an obvious choice for a sports photographer, providing a whole range of focal lengths and allowing him to switch his attention from one part of the field to another and still fill the frame. But most professionals use a zoom only for special effects or

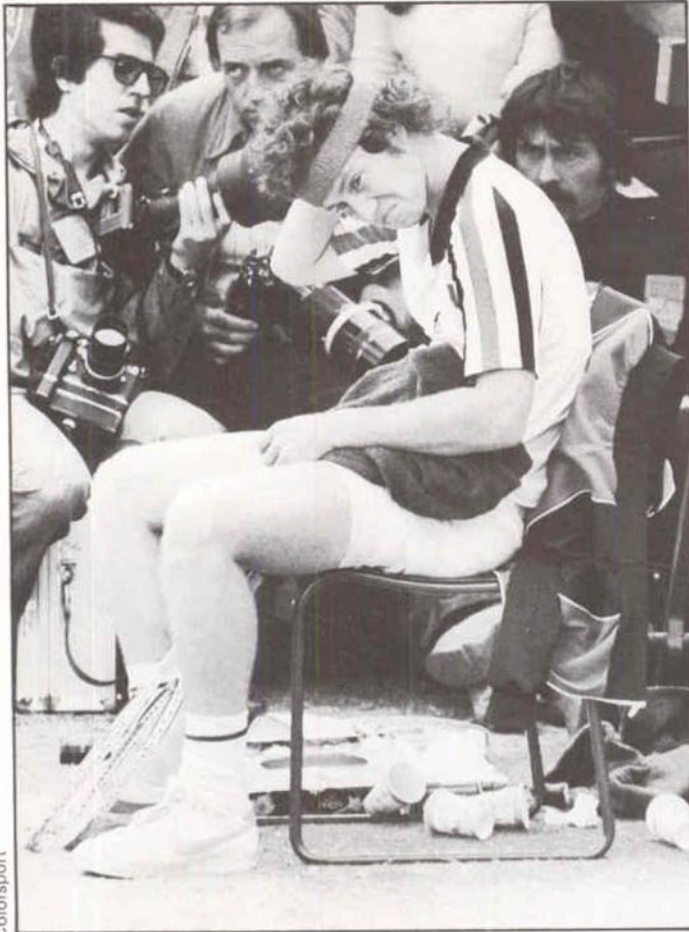
when conditions restrict them to carrying a single lens. In normal conditions, a fixed focal length telephoto offers equivalent or superior performance and a wider maximum aperture for a given weight.

If you are using a telephoto, you will almost certainly need some sort of support for the camera. Hand held 200 mm shots can be taken, but the results are rarely completely sharp. A monopod—a one-legged version of a tripod—is probably the best solution. It is light, easy to carry, needs the minimum of space to erect and allows you complete freedom of movement with the camera, far more than a tripod with even the best pan-and-tilt head. Professionals find a monopod indispensable.

One other piece of equipment that may be useful though by no means essential, if you are keen on sports photography, is a motor drive for winding on the film automatically. Because in many sports the action happens so quickly, you have to keep your eye to the viewfinder all the time. Look away even for a second to wind on and you may miss a terrific picture. A motor drive solves this problem, though it can only be fitted to a camera designed to take one.

As for film, this depends on the weather conditions more than anything. The speed of the action tends to suggest a fast film for maintaining fast shutter speeds, but except in really gloomy conditions a fast film can be more of a nuisance than a help. Fast films tend to produce grainy results, and on a bright day they prevent you from opening the aperture to blur the background. In most conditions a fairly slow or medium speed





Colorsport

Fred Mayer/Magnum Photos

Exhaustion *It is the human element that often makes sports photographs—look out for the reactions of players in between the action*

film—in the range 64 to 100 ASA (ISO)—is fine, but in a fickle climate it is probably a good idea to take along a faster film—a 200 or even a 400 ASA in case the light closes in.

With continuous action on the field, there is a great temptation to shoot with a high shutter speed all the time. Although you can't go far wrong by doing this, it does not necessarily produce the most interesting pictures. It is true that high shutter speeds freeze the action and also allow you to use a wide aperture to isolate the subject against a blurred background. Indeed professionals tend to use high shutter speeds all the time because their pictures must be clear and 'artistic' effects are out of place—there is no such restriction on the amateur. Dramatic pictures with a tremendous amount of movement can be made by panning—following the subject in the viewfinder while taking the picture—with a slow shutter speed of 1/60 or even 1/30 second. This keeps the subject's body sharp, the limbs slightly blurred and the background an indistinct streak.

Too many panned shots, however,

Choosing the viewpoint *It is always worth looking for the unusual angle. Here a low viewpoint makes the horses loom over the camera dramatically*

Candid shots *If there is nothing happening on the field, there is often tremendous potential for candid shots among the crowd of spectators*

could become boring, and a good compromise shutter speed is 1/250 or 1/500 second which freezes most of the action while allowing just enough movement to give the picture a little life.

Blurring the background

While in most situations you can move your subject around, or move around your subject, to find a good background, in sports photography you are usually stuck with whatever happens to be behind the players. Invariably this is totally unsatisfactory—a crowd of spectators or an unsightly scoreboard, detracting from the main picture. The only way to overcome this is by using a wide aperture to keep the background out of focus.

But when the subject is moving about at high speed—and at worst is running towards you—it requires a lot of practice to get the hand-eye co-ordination just right so that you can 'pull' the focus as the subject bears down on you. Until you are absolutely sure of your ability to do this perfectly, it is probably better to shoot at $f/3.5$ or even $f/4$ rather than opening up all the way to $f/2.8$, if your lens allows it.

Deciding when to make the final commitment and press the shutter is largely a matter of experience. Once you have

been to a football match or an athletics meeting a few times you learn to anticipate moments of high drama. There are numerous highlights in tennis, for example, but an experienced sports photographer will be particularly wide awake when there are close-to-the-net volleys being played. There may be dynamic shots of players lunging for difficult returns or falling as they miss. But tennis is a very reactive sport and it is worth keeping your eyes open for emotional expressions between shots. One of the features to look for in all sports is signs of effort, not just in the face but in the whole body movement. The final result will look far more lively if the player seems to be really working. In tennis, this means that the best shots tend to come immediately after a player has made a stroke rather than before.

Every sport has its own set of standard 'peak of the action' pictures. They can be moves from set positions—the line-out in rugby or the service in tennis. Or they could be classic action shots of stars—Borg's backhand or Pele kicking the ball. Any number of shots of these situations have been taken. Professionals' files should be full of them, because they have to provide such basic shots for newspapers on demand. These pictures are visual clichés and it is a good idea to look for new situations for potential pictures. Look around for less obvious points of interest—a footballer does not need to have the ball at his feet to make an exciting picture.



World of photography

Boys photographs girls

Taking pictures of beautiful women may sound like an easy way to earn a living, but, as Michael Boys explains, it involves a lot of hard work

'Visiting hot places with hot women to take dirty pictures' sounds like the starry-eyed young amateur's idea of 'glamour' or 'girl' photography. In fact, it is how Michael Boys, at 50, describes probably his most substantial, certainly his most enjoyable, source of income.

Boys left school at 14, and worked his way up in the photography business through local papers, running a news picture agency, then undertaking theatrical and women's interest work. He sums up the lasting appeal of girl photography as its challenge: 'it's incredibly difficult to photograph a girl without any clothes on and actually get a pictorial result which is sexually exciting or fun, artistically pleasing and witty, and also acceptable to both men and women.'

The work of Boys, and other photographers he admires (such as Sam



Daily Telegraph Colour Library



Haskins and John Thornton) needs to be carefully distinguished. They do not, in the conventional sense, regard themselves as glamour photographers, reserving this label for the 'cheesecake' style of photography, which, as Boys puts it, conveys empty sex appeal.

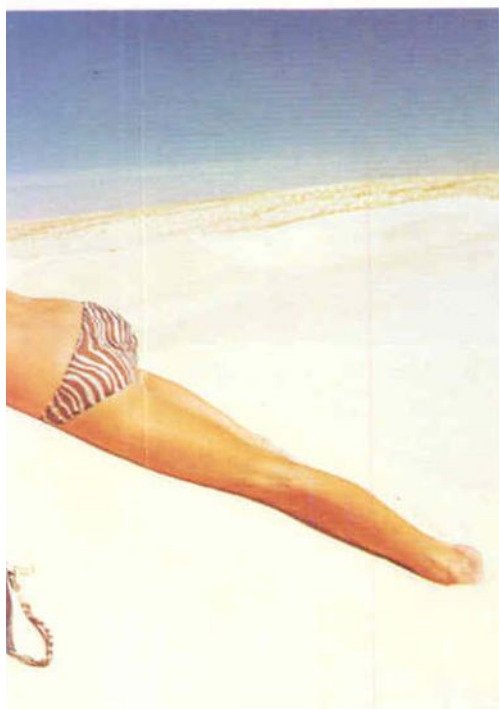
Boys, by contrast, sees himself as putting girls on the page in a witty, sexy way which makes you say 'I'd like to meet her'. Typical (and world wide) markets for his pictures are the smarter type of calendar produced as a prestige give-away for businesses, and photographic magazines for the amateur.

For Boys, making things perfect begins well before going anywhere near a location. In this type of photography, girls are, to a great extent, the pictures. Use unattractive girls, and you will appear to be a bad photographer. So Boys insists on choosing the models himself.

Backlit by daylight An imaginative use of background, shot in natural light on Kodachrome 25



The photographer Michael Boys with the Nikon automatic which he uses for most of his work



Sand dune This picture was taken in the Sahara, using a polarizing filter to eliminate glare from the sand

Second only to the choice of model is the location. It has to be a place with pictorial possibilities, it has to have a couple of weeks guaranteed sunshine and it must offer privacy. Obviously, it should not be too far afield.

The front-running choices of location usually come down to one of the Greek islands (Boys often uses Crete or Rhodes), and the best time of year is spring, when the greenery is fresh and there are plenty of flowers. He always insists that if a new site is wanted, the budget contains enough money to visit it, on reconnaissance, before the shoot.

With the girls and the site finalized, there is still plenty to organize. Like most professionals, Boys will not take girls on a trip unless they are ready-tanned, so the models are booked into clinics where they bask under sun lamps—the

right shade of brown usually being achieved after about a week. In the days before pre-tanning was available, the harsh, but necessary rule was that girls who showed the first sign of sunburn were put on the next plane home.

The models also visit a make-up artist before departure. She gives them lessons designed to help them achieve the natural, un-made-up look that Boys prefers. At some stage the artist makes up one half of the face, the model does the other half, and a Polaroid picture is taken to record the result for later reference.

Meanwhile, a stylist is collecting clothes and props. For Boys, the right clothes are very much part of the inspiration of good pictures, and if the stylist does her job well she finds sexy, 'non clothes' which fall off easily.

Hair is probably the single biggest headache on location—it continually spoils more carefully set-up shots by blowing out of place, so plenty of combs

Calendar shot One of a set of 'gypsy' pictures which Boys shot in the South of France for a tyre company



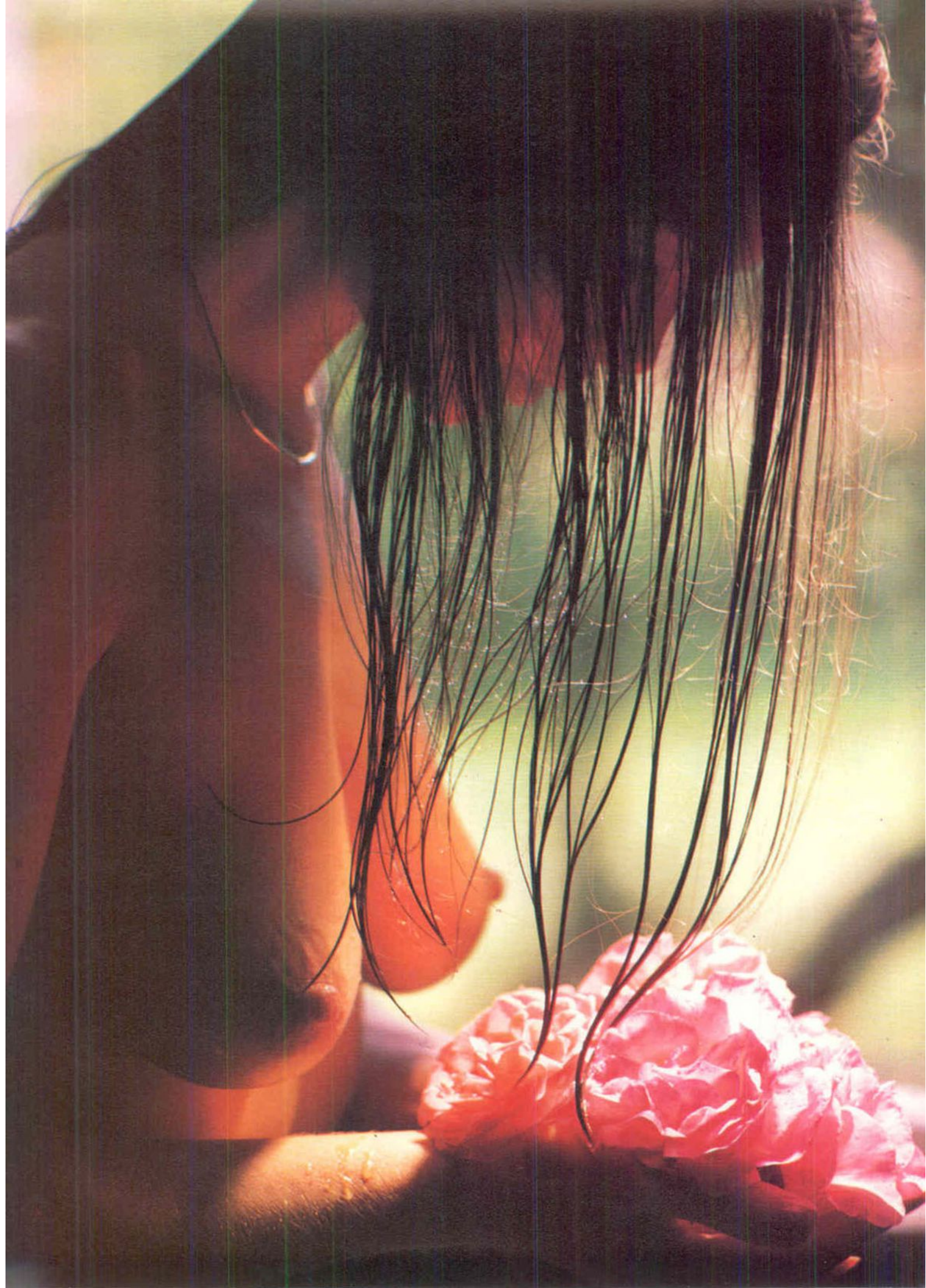
and ties are taken along. Hair spray and heated rollers are other essential equipment, as is body make-up. Boys prefers the water-based type which can be applied with a sponge. When it is dry, he adds a little mica powder to bring a shine to the skin.

Underlining the supreme importance of good preparation, Boys says that if you want to be a successful photographer of girls you have to be interested in the whole gamut of presentation. 'Don't think you are just a photographer—you're not,' he stresses.

Cameras and film

Boys uses an automatic Nikon. 'I just look in the viewfinder and if it says OK, I push the button.' He uses a range of lenses running from a 24 mm wide-angle to a 300 mm telephoto, and occasionally

Courtesy of Avon Tyres



borrowed a zoom or square fish-eye (which gives a square, rather than round image on the negative). He does not often use a zoom, however, because much of his work is back-lit and zooms tend to give flare in those conditions. His favourite lens is the 300 mm because its minimal depth of field gives an image with just the girl, in bold outline.

Michael Boys relies entirely on the camera's built-in exposure meter, but takes care to 'read' the scene with his own eyes for especially light or dark areas which might falsify the metered exposure. If a picture is technically very difficult, he will use a Bronica, taking 120-size film, because the Polaroid back facility enables him to check exposure before shooting.

Choice of film is usually Kodachrome, which he admires for its softness, and



Driftwood For this shot, Boys used an 82A filter to compensate for the red content of the early morning sunlight

fine rendering of skin tones, browns, and greens. For extra speed he uses Ektachrome but finds that it requires much more critical handling—for example in the choice of colour correction filters. He usually takes about a hundred rolls on the average fortnight's trip. When it does arrive, the moment for taking pictures is, says Boys, extremely tense. 'I've usually dreamed up some awful scheme—say a girl draped over a rock 50 feet up a cliff.' The whole shoot is bound to be dominated by practicalities, and until they are overcome there is bound to be tension. At the same time, he is doing his best to give the model the impression that she is good from the

Caribbean colour This dramatic picture was taken on one of Boys' more exotic locations: the island of Mustique

Girl with wet hair This striking image was taken on daylight Kodachrome using daylight and a filtered spot

start—she is the star of the show, and that she looks marvellous.

If a model is looking dreadful, he uses the tactful approach, never criticizing (unless she is someone he knows well enough), but slowly trying to adapt what she is doing in front of the camera to what he wants. 'A girl needs to be made to think that she, not the photographer, is modifying her poses as the work proceeds.' The correct attitude is that if she is doing it wrong, you, the photographer, have set it up wrong.

Setting up and shots

Boys's main advice to amateurs interested in girl photography is that there can never be too much preparation. Everything about the experience of being photographed should be as attractive and amusing and as natural as possible for the girl. Clothes, especially, should be scrupulously clean as well as exciting to wear. If working indoors, the temperature should be very hot—if it is a comfortable working temperature for the photographer, it will be too cold for the girl. She will not be comfortable, she will not relax, she will probably get goose-pimples and the session will be ruined.

For those doing their first-ever girl photography, Boys recommends concentrating on parts of the body rather than the whole thing. Keep away from the sexually most exciting areas to begin with, concentrating instead on the back, bottom, hands or legs. Then build up gradually to the whole personality.

If a photographer finds a girl who will model partly clothed, or nude, he should not be disappointed if, when it comes down to it, she does not have everything he had hoped for. She is bound to have something good—perhaps a good profile, legs or skin—and any one of



Michael Boys/Courtesy of Avon Tyres

Gypsy caravan Another calendar shot.

The caravan had to be taken from England to the French location

these can be the basis of good pictures. If it is a good profile, photograph that in every way possible, from fully lit to silhouetted. This way, the girl's bad points will seem less important as her confidence builds up.

Above all, Boys feels that the mistakes amateurs make in this type of photography stem from the attitude summed up by 'you do something with your body, I'll shoot it'. It is the photographer who ought to have the mental picture of what he wants and it is he who must get the girl to achieve it. In other words, it is the photographer's job to get the pictures he wants.



The family car

Whether the car is brand new or has only sentimental value, taking a series of photographs of it can be a challenging project providing many possibilities



John Sims

This assignment features a Ford Fiesta, an ordinary family car of the sort many motorists are likely to own. With a more exotic car you should find it easier to get some dramatic results.

John Sims is a photographer noted for his landscapes and for a wide range of other subjects. His first thoughts on locations took into account the colour of the car:

'Red or silver is particularly effective for this sort of thing, but it is most important that you choose a background which compliments the colour of the car.'

The appearance of the Fiesta is not

especially striking, so it was very important to try different viewpoints to get the most flattering effects. It can help to walk around the car looking through the viewfinder to decide which aspects are the most pleasing.

'Don't restrict yourself to one point of

Above An ordinary shot of the car can look impressive if you choose the right background. **Below** A 20 mm wide angle lens can produce some striking results. **Right** An unusual location can provide an interesting shot, such as this one of the Fiesta crossing a deep ford

view or one angle,' advises John. 'I always try to explore as many possibilities as I can. People are used to seeing cars from the same height all the time, but there is no reason why the photographs should be taken that way.'

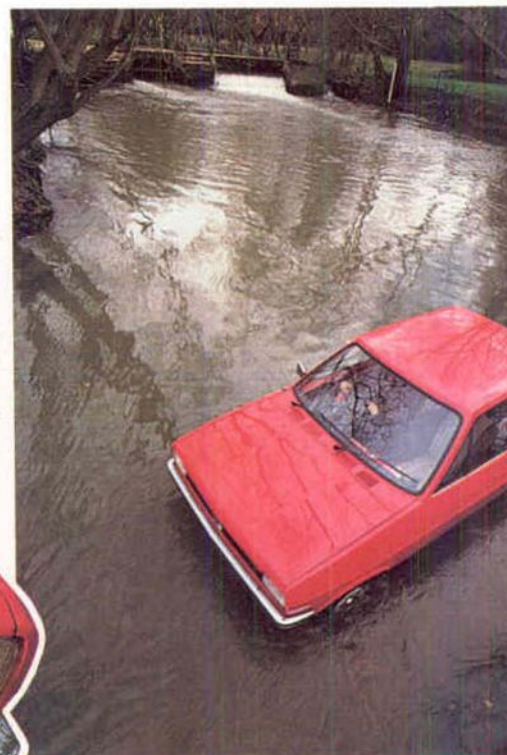
For the best combination of sharpness and colour, John chooses Kodachrome 64. Because of the overcast day he used an 81A filter to warm up the tones. John found the diffused light to be an advantage because the lack of extreme contrast used by hard directional light meant that the conditions did not exceed the film characteristics. The slow film speed and the need for plenty of depth of field meant that slow shutter speeds were chosen and so he used a tripod with a cable release for most of his shots.

With his 35 mm SLR camera John used his 80-200 mm zoom most of the time. This allowed him to frame his shots quickly and precisely. A 35 mm lens was helpful for filling the frame at close range while the 20 mm wide angle created some exaggerated effects.

The angle of view and the choice of lens were not the only techniques which John used to add variety and atmosphere to the shots of the Fiesta. Switching on the headlights for some of the time added an extra touch to one of the shots while opening the doors for another helped to give the series some variety. John also got some interesting effects by moving in close and concentrating on the reflections in the paintwork. However he cautioned about trying any one effect or location too often.

For this reason John chose more than one background for the car. The woods provided sharp contrast with the open fields and photographing the car going through a ford offered good possibilities.

John's pictures show that some of the





Top The car need not be framed centrally if the setting is right. **Above** John added some variety by photographing the car with the doors open and the headlights switched on

shots depend almost entirely on the location for their impact. The car, like many other possible subjects, adds a central area of interest, turning an ordinary landscape into something more striking.

John made a point about the setting: 'This type of background completely eliminates the social context of the car. There are no houses or streets to suggest the type of person associated with the particular car. Many advertisements use this method of a neutral setting, unless, of course, they are trying to sell an upmarket product.'

John also suggested photographing

the car in motion to contrast with the static shots. To do this he tried panning at different shutter speeds and also photographed the car moving towards him in the distance.

Seeing the possibilities as endless, he added:

Anyone familiar with the basics of photography should be able to get some good photographs. Choose some good locations, make sure the car is clean and then experiment with different ideas. You're bound to produce some good results in this way.'

Top right This panned shot was taken at 1/15 second. **Centre** Look out for details such as these reflections in the paintwork. **Below** John Sims shows that the car does not necessarily have to dominate the scene to produce an effective photograph





Buying a zoom lens

A good zoom can do the job of several fixed focal length lenses. By running a few simple tests before buying a lens, you can be sure of getting good quality

There are probably more zoom lenses on the market than any other piece of equipment. Major companies vie with the smaller ones in claiming good value for money, and with so many different models available, test reports are hard to find. What's more in a changing market, test reports can be rendered useless by alterations in the ranges of the manufacturers.

But it is possible to select the best lens for your photography without running great risks, as long as you know the points to look for. Your first task is to become familiar with the technical terms used, so that you can narrow down the range to a few units which you can then test for yourself before you actually decide to buy one.

Types of zoom

The value of zoom lenses is that focal length can be varied at will, and this variation is achieved very simply by moving one group of lens elements backwards or forwards along the barrel. Moving one element changes the distance, between the lens and the image, that gives the maximum sharpness. So the lens must also include another focusing element in order to keep the picture sharp.

Zoom lenses can be divided into two

basic types—the *one-touch* and the *two-touch*—according to how the movement of the lens elements is controlled. You will often see a third type—the *macro zoom*—advertised, which can also be used for close-up photography.

The two-touch or two-ring zoom has separate control rings around the lens barrel. Turning one adjusts the focus in the same way as on a normal lens. Turning the other ring zooms the focal length of the lens in and out.

With two-touch systems, operation is usually very smooth and you can easily make fine adjustments to the focal length to improve framing. But with two separate control rings your hand must switch from one to the other. This takes time and you could miss your picture.

With the one-touch system, however, one ring controls both zoom and focusing. Twisting the ring, in the normal way, controls the focus, while the lens is zoomed simply by sliding the ring up and down the barrel. Because the zoom action is like a trombone slide the one-touch zoom is often referred to as the *trombone* type.

Trombone type zooms can certainly be operated much more quickly than two-touch zooms and for any situation where rapid action is called for they are ideal. For sports photography, or even just



Leo Mason

tracking boisterous children around the garden, the speed with which the image can be framed and focused with a one-touch zoom is invaluable.

Unfortunately, it is difficult to make fine adjustments to focusing quickly, especially at maximum focal length. Although this is not a big disadvantage for most photographers, you will rarely find one-touch zooms on cine cameras for this reason. Another snag is that it may be difficult to keep the image in



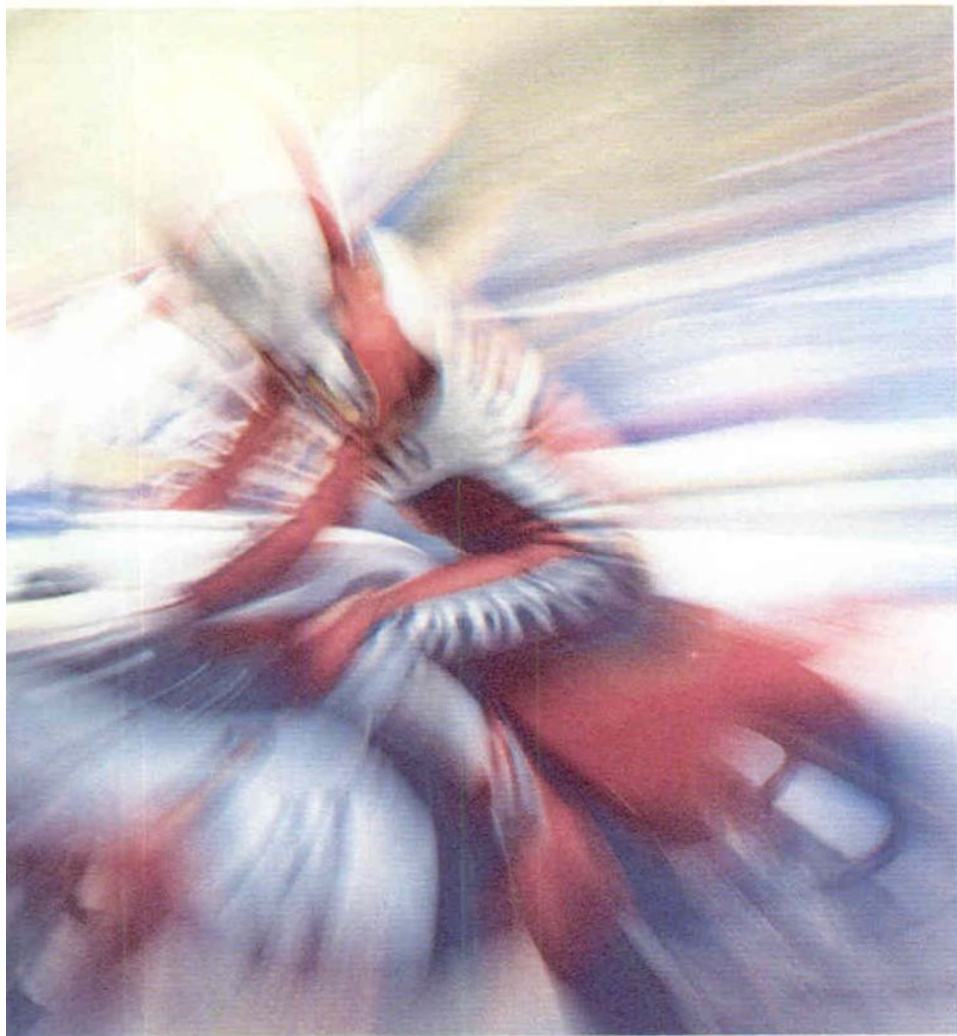
One-touch zoom The same ring is used for both zooming and focusing. Sliding it changes the focal length of the lens



One-touch focus Turning the ring on a one touch zoom brings the lens into sharp focus as on a conventional lens



Two-touch zoom The ring nearest to the camera changes the focal length of the lens



Zoom effect Changing a zoom's focal length during an exposure gives a dramatic impression

conjunction with your standard lens, or a special supplementary lens.

If you wish to buy a macro zoom, a useful test is to see how close to an object you can focus. This will give you some idea of its macro capabilities. Some lenses will focus no closer than three metres and even with a long focal length the image on the negative is very small. Go for a lens which gives you the biggest image you are likely to want.

Lens faults with zooms

Very much more glass is used in the construction of a zoom lens than in a fixed focus lens and this literally magnifies the standard faults you find in any lens. The moving elements do, however,



Jon Bouchier

precise focus as you zoom, but for many people the advantages outweigh the disadvantages.

Some people suggest that one-touch zooms are so easy to use that photographers become lazy, and do not give enough thought to the choice of the correct focal length, but this is really only a matter of opinion. In the end, it may be the convenience and feel of the lens that tips the balance of whether you like it or not one way or the other.



Two-touch focus The ring nearest to the front of the lens is used to bring it into focus in the usual way

Macro zoom

If you wish to do a lot of close-up work, you may be tempted by the idea of a macro zoom.

The word 'macro' comes from the Greek 'makros', meaning 'long' and a macro lens is a lens designed to be used for extremely close-up work. Since at very close range, the image on the negative may be almost as large, if not larger, than life, the capabilities of macro lenses are often described in terms of the ratio between the actual size of the image on the negative and the size of the real thing.

The term 'macro' lens is fairly loosely applied, and although most macros produce an image on the negative about a quarter of life size (a ratio of 1:4), macros can give an image/life ratio of anything from 1:10 to 10:1. If the image is any bigger than ten times life size (a ratio of greater than 10:1), the lens ceases to be a macro and becomes a micro lens.

Only one or two macro zooms are designed specifically for close-up work; most are standard zooms with an extra macro facility. Generally speaking, the overall image quality of a zoom lens fitted with macro is not as good as that of a plain zoom lens. If you intend to do a lot of close-up work, it is probably better to buy either extension tubes to work in

Macro markings Macro zooms are engraved with reproduction ratios (in orange here) as well as zoom, focusing and aperture scales

create their own special problems which, in a quality zoom lens, should have been corrected by the lens designer.

A fairly common problem with some of the simpler and cheaper zoom lens constructions is a fault called vignetting—partial darkening of the image at the frame corners. Other zoom lens designs get round this by employing large lenses that seem unusually large for the maximum apertures that are offered. Few zoom lenses approach anywhere near the speed offered by comparable lenses of fixed focal length.

With a test, which should take in a range of apertures and the various focal lengths of the zoom lens, it may also be possible to detect signs of image distortion. You can do this by checking the trueness of horizontal and vertical lines at the very edges of the photograph. Lines at the edges bowing towards the centre of the picture indicate that the lens is suffering from *pincushion distortion*. If the lines bow outwards, this is described as *barrel distortion*. Evidence of distortion suggests a lens 'fault' only if the test camera faces the test subject absolutely square-on.

Distortion may vary from the pin-cushion pattern to the barrel shape during the course of the zoom range and it is not unusual for some of the older, and the newer but cheaper, designs to exhibit both. Unless either is particularly severe (a suggestion of worse lens faults too) there is no point worrying too much about it. With most modern zoom lens designs, you may not even notice the existence of distortion.

All lenses have their own image-forming characteristics and these are particularly significant if you do much colour work. A film test using your usual materials is essential if you want to match the fine nuances of colour reproduction which you get from your exist-

ing lenses. Zoom lenses may be particularly difficult to match in this way, even if you do buy a lens from the same manufacturer.

Feel

A lens must feel 'right' if you are to use it comfortably and confidently. Before you buy, attach it to a camera and assess the feel. Some people prefer one-touch zooms, for instance, simply because they like the feel of the big focusing ring.

With some cheaper zoom lenses, the zooming and focusing action might feel uneven and gritty. Pay no attention to a salesman who might tell you that the lens 'has to wear in'—it will not, it will simply wear out.

Equally important are balance and weight. Few zooms can really be described as compact—some cine camera zooms are over 1 m long—but you must be sure that you can hold the lens still at relatively slow shutter speeds.

When you are in the shop, try the lens for length and weight and see how easy it is to handle. Attach the lens to your camera and try resting the barrel on your raised forearm while gripping the camera with your other hand. Then press the shutter with the index finger of the hand holding the camera. If the shutter is set at fairly slow speeds—1/60 and 1/30 second—you will soon discover how much the end of the lens barrel can wave up and down visibly.

Testing a lens before buying

The best way to buy a zoom, or any other kind of lens, is to take photographs with it. This means first narrowing down your choice to just a few lenses—preferably no more than three—and fitting them to your camera.

Most dealers will allow you to do this

if the lenses are readily available, as long as you do not expect to take each one beyond the doorway of the shop in order to test it.

Choose a time when the shop isn't busy, and use a roll of slow colour transparency film like Ektachrome 64. Many cities have laboratories that will process these films in an hour or two (look in Yellow Pages) so you can see the pictures quickly. Unless you have

plenty of time, do not use Kodachrome film which takes a rather long time for processing. Try to use a tripod, but if this is not practical, use a fast speed such as 1/250 second.

You will need to test a lens for four features: sharpness and contrast at normal distances, distortion (which is whether or not straight lines in the subject appear straight on the film), vignetting and close-up performance.



Lens testing Take pictures of lettering from a distance to compare the performance of a number of lenses. The picture on the right shows the set-up that was used for these tests. The chart was photographed at the centre and edge of the picture, with a 135 mm lens and a 70-150 mm zoom at 70 mm and 150 mm



The 135 mm lens gave good quality results with the chart at the centre (left) and edge (right)



At 70 mm, the zoom lens gave quite a sharp image in the centre (left) but edge performance was much worse (right)



At 150 mm, the edge (right) was worse than the centre (left). Note vignetting and pincushion distortion (above)

On some zoom lenses, the maximum possible aperture is less at full focal length and on a dull day you may have to use a very slow shutter speed to compensate. If the lens is too heavy or too long to hold steady under these conditions, its usability will be restricted.

Mounts and features

The restrictions imposed by a particular camera mount on the choice of lenses available in that fitting can be great, and usually the popularity of that particular mount and the length of time it has been on the market are decisive factors. The popular ('universal') screw mount is exactly this and there is a great choice of zoom lenses for this.

Sharpness and contrast

How 'good' a lens seems to be is a combination of these two qualities, and it is not really very helpful to separate them, except for very special purposes like document copying. The best object to photograph is probably fine lettering, such as a sign in a shop window, or a street poster. This first test should be carried out on a distant subject, which means, for most lenses, something at least ten metres away. In the test shown here, an optician's eye test chart was used because it is printed with a wide range of type sizes.

You will need to take photographs of the subject at the centre of the picture and at the edges, where the quality is generally poorer. It is also a good idea to test it both at the widest aperture (lowest *f*-number) and at some moderate aperture like *f*/8. When testing a zoom, you should ideally make tests at the shortest focal length, the longest focal length, and midway through the range. If you go through all the combinations of these three, you will have taken twelve pictures, so it is crucial to keep an

The recent swing towards bayonet-type lens mounts has had the effect of restricting the choice of some of the newer and more sophisticated zoom lenses.

Start your selection by deciding what focal length range you would like your zoom lens to cover. Base this on your particular photographic requirements. Look then for the choice of lenses available in your camera fitting.

The list will probably contain lenses which have a fixed mount, and others which have an interchangeable mount or adapter. Fixed mounts are usually slightly cheaper, but you have to change the lens if you ever change the camera. With an interchangeable mount, how-

accurate record of what you do.

Distortion

This is much easier to test than sharpness, because it does not change when you stop the lens down, and is most pronounced at the edges of the picture. Turn the camera so that the long side of the frame is vertical, and line up the picture so that a vertical object, such as a lamp post is just within the frame. When testing a zoom lens, take pictures at the longest and shortest focal lengths and at one in between if possible. If you can arrange to include the vertical in your sharpness test, you will be able to save on film.

Vignetting

To test for vignetting, you will need a perfectly evenly illuminated subject. An overcast or uniformly blue sky is ideal. Point the camera at the sky, and make exposures at full aperture and at *f*/8. Do this at the three points in the zoom range: both extremes, and in the middle. Any vignetting will show up more if you underexpose slightly.

Close-up

Focus the lens on its closest distance, and take pictures of a sheet of newspaper, once again at full aperture and *f*/8. If you are testing a zoom lens, set it to the longest focal length, which will give the largest size. Macro-zooms usually set the longest focal length automatically when used in the macro mode.

Interpreting the results

Have the film processed, and examine the slides with a magnifier, or take the lens off your camera and use that. If you are making a comparative test between several lenses, it is a good idea to include an expensive lens among them. This way, you will have a yardstick with which to compare the other lenses.

Examine your target at the edges and centre of the frame, and compare the pictures taken by the yardstick lens with those at the same aperture and focal length, using the lenses under test. By carefully inspecting the fine detail in each picture, you should find it easy to

ever, you can choose to keep the lens when you buy a camera with a different mount, simply buying the appropriate adapter instead. Interchangeable mount lenses are now unfortunately not widely available.

Wide maximum apertures aid focusing and viewing considerably but, in comparison with lenses of fixed focal length, you pay heavily in terms of the additional size of the lens, its cost, and perhaps lowered standards of performance. By ordinary lens standards, however, there is no such thing as a wide-aperture zoom lens, as attractive as this would be for 'available light' photography. Normal maximum apertures start at *f*/3.5.



Jan Bouchier

Close-up test By photographing a newspaper, it is easy to weed out a second rate macro-zoom

spot the differences between the lenses.

Your standards on the distortion test will depend on the kind of pictures for which you will be using the lens. For architectural photographs, straight lines on the subject must be rendered perfectly straight on the film, but this is much less important if a landscape is the subject.

Many lenses show vignetting at full aperture, with the centre of the frame perfectly exposed, but the corners slightly underexposed. The photographs of the overcast sky will show clearly if vignetting is present. Once again, how much vignetting you are prepared to tolerate will depend on the type of pictures you plan to take.

When you come to look at the close-up tests, do not forget that the only lens which will give really good results at short distances is a true macro lens, and while a macro zoom is fine for occasional close-up use, this is not what it is really best at doing.

If you have three zoom lenses to test, and economical use of film is important, these lens tests could be abbreviated by testing only at full aperture, and at the extremes of the zoom range. Though not quite as satisfactory, this would still provide the basis for a comparison.



Macro-zooms Some zoom lenses can be used at close range to produce close-ups. They are usually not true macros, though

Trevor Wood



Cropping with zooms *If you are using a zoom lens, it is much easier to crop and compose a picture in the viewfinder*

Zoom range *There is a vast range available. Without trying out a lens, it is impossible to tell good from bad*

When looking specifically at lens features, start by considering filter size. Good quality filters are essential if you are going to use them. As they are extremely costly, there is little point buying a set for each lens you have. If possible, match the zoom lens's requirements with one of your existing lenses. Filter size is normally quoted in the technical literature, and usually engraved or otherwise marked on the lens near its front.

With some particularly long and large zoom lenses a special tripod mounting bracket is provided. This takes the weight of both the camera and the lens, avoiding strain on the lens mount which would otherwise result from mounting the camera on the tripod. A pistol-grip may also be fitted to the tripod bracket if greater mobility is required—ideal for action photography of any kind.

A lens hood serves two important functions in shielding the front elements from non image-forming light and protecting the lens front from knocks and scrapes. Some are provided, separate, with the lens and simply screw into place on the filter thread. Others are built-in, sliding types which are simply pulled out for use. Neither type impedes the



Jon Bouchier/Lenses from Euro foto centre

use of filters on the lens.

The quality of the bodywork of a zoom lens is also worth considering—a shoddy exterior may suggest the same inside, a disturbing thought if you consider the amount of physical movement that occurs time and time again during the course of zooming.

The aperture setting ring and the control ring for zooming and focusing must be provided with a grip that feels comfortable in use. If you shoot out of doors in cold weather, see whether it is possible to operate these properly with gloved hands, for instance.

Base your final selection mostly on the

assumed or tested quality of a particular zoom lens. Higher cost does suggest better quality. Do not assume a lens with fifteen elements is any better than one with, say, eleven: lens construction is no pointer to zoom lens quality, and you have to tread warily through the remaining technical specifications also.

Where possible, do try out some of the lenses on your short list—if only to see how they feel and handle on your own camera. If you do have the chance to run off a test film, remember that comparisons are only valid if the test conditions remain the same for all the zooms which you try out.



World of photography

Oxford Scientific Films

From sticklebacks to supernovae, Oxford Scientific Films have won world-wide acclaim by specializing in the sort of shots that others might consider impossible

In the opening sequence of the film *Superman*, a tiny capsule bearing the infant hero hurtles through space past a myriad of stars and swirling nebulae on its voyage to Earth. To get this superb example of special effects, the producers of the film did not draw on the vast resources of Hollywood, but went to a small, one-storey building half-hidden in quiet woodland outside Oxford in England—the home of a remarkable organization known as Oxford Scientific Films.

In their rural base, Oxford Scientific Films have created a whole range of startling special effects for feature films as diverse as *Alien* and *The Muppets*. Using their own specially developed optical equipment, they can, for instance, use relatively small models to simulate the view from a spacecraft skimming over the surface of some distant planet.

An even cleverer technique enables them to film miniaturized man and a



G I Bernard/Oxford Scientific Films



G I Bernard/Oxford Scientific Films

Ladybird mimic Taken on the optical bench. Strong electronic flash helped to backlight the subject.

Secret squirrel Patience and a telephoto lens are two essentials for a shot like this of a very timid animal

giant spider advancing to do battle with each other. Both man and spider are real and the sequence is shot in one take.

Yet while they make stunning special effects for science fiction films, OSF's real interest lies in the natural history films with which they have made their name. In the 50s and 60s, wildlife films tended to feature only the larger and more glamorous animals such as lions and bears. The remarkable achievement of Oxford Scientific Films has been in beautiful and fascinating shots of tiny creatures such as insects and small

reptiles. Creatures that people rarely notice or could even see are shown large and clear going about their everyday lives. Sequences of maggots infesting a body or ants building their nest dramatically reveal the struggle for survival, while the exquisitely delicate forms of marine plankton and other small creatures are highlighted in a brilliant glow on the screen.

Details almost invisible to the naked eye—the hairs on a spider's back, the feelers of tiny sea creatures—are shown with stunning clarity, and movements too fast or too slow to see properly are captured perfectly.

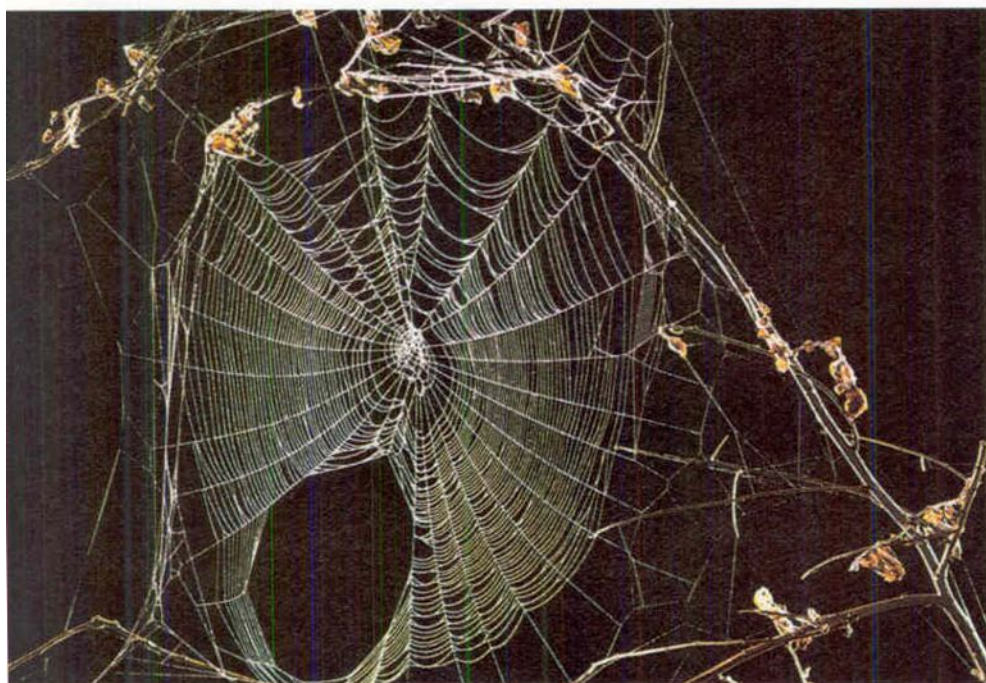
What is surprising is that Oxford Scientific Films have not only shown that such tiny creatures can be as fascinating as the more glamorous animals, but that they have managed to film these creatures at all. It was previously believed that it was impossible to film them effectively, but with their detailed biological knowledge and a wealth of



G I Bernard/Oxford Scientific Films

Wash and brush up This harvest mouse was photographed on a large studio set, using a 105 mm Micro Nikkor lens

Spider's web The spider obligingly spun its web on the studio set. This is dark field illumination on a large scale



J A L Cooke/Oxford Scientific Films

technical information, OSF have overcome many of the problems and established themselves as world leaders in this form of photography.

The beginnings of Oxford Scientific Films go back to the late 50s when Gerald Thompson, then a lecturer in entomology at Oxford University, was conducting some research on the alder woodwasp. Thompson was showing some slides of his research at a conference when naturalist Peter Scott remarked that the wasp might make a good subject for a film. Unaware of the technical difficulties that faced him Thompson began to make the film, tackling each problem as it arose. Solving the problems of vibration and shielding his subject from the heat of the lights, Thompson completed the film and won first prize in a competition run by the BBC and the Council for Nature.



Peter Parks/Oxford Scientific Films

Inspired by the success of this film, Gerald Thompson went on to make many more nature films, with his colleagues in the biology department at Oxford, for use as research tools and as undergraduate teaching aids. They soon all became fascinated by the challenge facing them.

Eventually, they decided to give up the academic life altogether and concentrate on making films. Fortunately, they had already made a name for themselves and financial backing was soon forthcoming. In 1969, the company was established in the buildings it still occupies near Sir Winston Churchill's birthplace at Blenheim.

The eight directors of Oxford Scientific Films are all trained biologists—and this is an important factor in their success. One of the reasons they are able to get such wonderful shots is that they usually know precisely what to look for, and where and when to look.

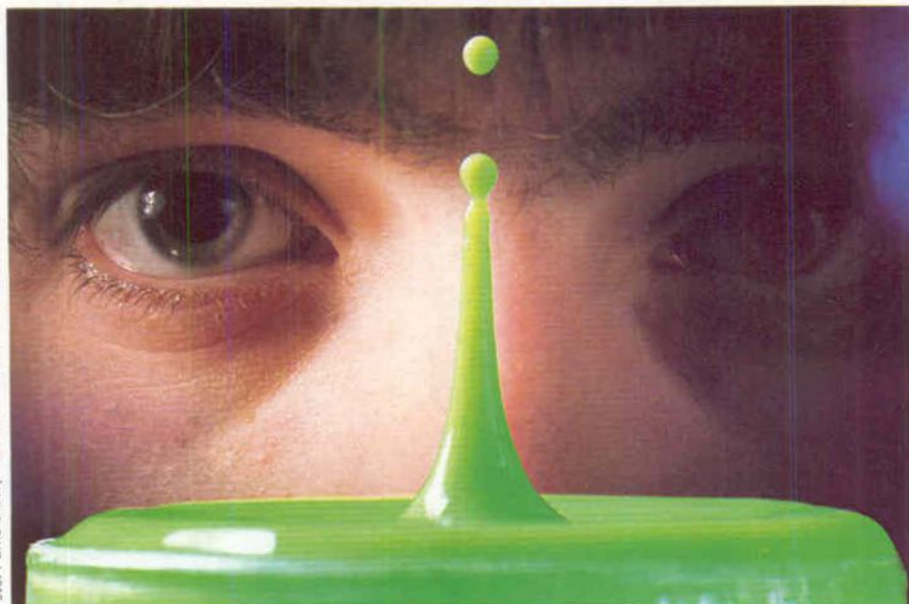
One example of this came from a film on the pollination of plants. When they went to film the pollination of the hammer orchid in Western Australia, they knew that the male thynnid wasp occasionally mistakes the hammer orchid, with its bright colouring, for the female wasp and tries to mate with it. During its mating attempt, the wasp's head is covered in ripe pollen which it takes to other hammer orchids and pollinates

Crustacea plankton These were shot using the optical bench on location on the Great Barrier Reef off Australia

Larger than life Oxford Scientific Films are justly famous for the high quality and definition of their work



Peter Parks & Stephen Dalton/Oxford Scientific Films



Eye opener Both droplet and eye are the centres of planes of focus in this shot made using the aerial image bench

them. Although the false mating is over very quickly, the two-man team knew that it is an essential part of the orchid's pollination and even though they had to watch for twelve hours a day for six weeks, they eventually got their bit of film. This kind of detailed knowledge of the habits and habitat of their subject is an essential feature of the work of Oxford Scientific Films.

Surprisingly, none of the directors has any real technical background in cinematic and photographic work. But far from regarding this as a disadvantage, they feel it is positively valuable. John Cooke, the unit's specialist on spiders and stills photographs says: 'If we had known anything beforehand about the technical difficulties of the kind of filming we were undertaking, we would probably never have started—on a number of occasions we found that what we had just done was considered impossible by the experts!'

Nevertheless, although the staff of OSF are sometimes dismissive of their

technical abilities, the truth is that they have produced a remarkable amount of technical innovation for so small an establishment and they have developed a range of very sophisticated equipment. Whenever faced with a severe technical problem, they have always had the skill and inventiveness to build the hardware to provide the answer.

In the early days, there were two major problems with filming tiny creatures at high magnifications. One was the fact that even the smallest vibration would be magnified along with the

Caught on the hop

A studio set was built in order to photograph this Trinidadian tree frog. Electronic flash was used with a 135 mm lens. Close-ups of this kind can be taken using extensions



J A L Cooke/Oxford Scientific Films

subject and would make smooth filming impossible. The other was the heat from the bright lights necessary to illuminate these small objects properly—unshielded, this would be sufficient to fry the organisms in seconds. Both these problems were overcome with remarkable success by a piece of equipment that has now become an indispensable part of OSF's repertoire—the *optical bench*. The basic principle behind this is that by mounting both camera and subject on the same very rigid structure, any vibration is common to both and will not appear on film at all. This works so well that they can film without any problems from vibration even in a makeshift laboratory on a throbbing and rolling trawler at sea. Over the years, the bench has been steadily refined and is now a very sought after piece of equipment—which is one of the reasons why OSF try to maintain strict secrecy about their techniques.

Problems with illumination have always occupied a considerable amount of effort. If lit directly from in front, small transparent organisms such as water fleas would be invisible. OSF developed a system well known to Victorian microscopists as *dark field illumination*. Here the light source is behind the subject with a condenser in between. The condenser focuses light on to the subject and provides brilliant backlighting that





JAL Cooke/Oxford Scientific Films

shows up every detail. The centre of the condenser, in the field of view of the camera, is blacked out so that the subject glows brightly against a completely dark background.

While the dark background and glowing illumination of dark field illumination produced beautiful pictures, the staff of OSF realized that to photograph every organism this way would be rather dull. A significant achievement occurred when they developed a method—which they are keeping very much to themselves—of providing the same dramatic backlighting while introducing a background that suggested the creature's own natural environment.

But it was two major breakthroughs in their technique for coping with problems of scale that contributed to OSF's move into special effects filming.

The first of these is a refinement to the optical bench that gives an apparently impossible depth of field, allowing two or three focal planes to be incorporated in one camera shot. This means that the camera can include a full scale close-up and a person 10 m away in the same shot with both in focus. The device is known as an *aerial image bench*, and works by locating the smallest foreground object in the same image plane as a lens beyond. This lens is focused on another object, which then appears in focus behind the first object.

They soon realized that this had tremendous potential for miniaturization special effects, and many sequences in *The Micronauts*, Harry Saltzman's unfinished film about tiny explorers, were shot using this technique. The sequence quoted earlier involving the miniaturized man and the giant spider was also done in this way.

The second big advance was the development of the fancifully named *Astroscope* and its increasingly sophisticated successors, the *Cosmoscope* and the *Pathfinder*.

Like most of OSF's equipment, these were developed to solve a particular filming problem. In the case of the *Astroscope*, they wanted to be able to track a beetle through the undergrowth on the forest floor while maintaining a low camera angle looking up at the beetle. Tracking the beetle on a smooth surface would be hard enough, but OSF wanted to be able to follow under fallen leaves, through puddles or between rocks a millimetre or so apart.

Astroscope was their initial solution to this problem and within certain limits it worked superbly. By relaying the image

Face to face This confrontation between damselflies was shot in natural light, with the photographer up to his neck in water

to the camera body through an elaborate series of lenses, the viewer could follow the beetle through gaps as small as 1 mm across while retaining a reasonably wide angle view beyond.

Galactoscope and *Cosmoscope* go even further and, by a versatile periscopic arrangement, allow the camera to track less than 5 mm above the ground while gyroscopic stabilizers eliminate any problems from vibration. What is particularly impressive about these systems is that the camera angle can be changed smoothly and rapidly in any direction. So they can simulate the view from a plane moving rapidly over the surface, whether it is rolling or pitching or simply flying level. With this sort of facility, OSF were equipped not only to produce their own natural history films, but also a whole range of special effects.

OSF are now doing more and more special effects filming for science fiction but their real interest is still wildlife. Unfortunately natural history films of the type OSF specialize in are very expensive to make. The film on pollination, *The Sex Life of Plants*, which had a scheduled production programme of seven years by the time of completion in 1981, involved a huge investment of time, effort and finance. In 1980 alone, the company had to send teams to Greenland, Cape Town, Sardinia, Trinidad, Costa Rica, Utah, and Australia. The three minutes of film on the pollination of the hammer orchid in Western Australia cost over £10,000 to make.

Building the equipment is similarly expensive. Gadgets like the *Galactoscope* incorporate expensive lenses and precision machinery. The only way OSF can afford to build them for the natural history shots is by using them for more lucrative special effects filming as well. OSF are quite enjoying the challenge of the science fiction work, but they will always go back to the wildlife films simply because that is what they really love doing.



Eye, eye Electronic flash, giving front and side light, together with a low power microscope lens captured this horsefly's head. Each compound eye is made up of thousands of separate facets, each a tiny light focusing lens

JAL Cooke/Oxford Scientific Films



Stephen Dalton/Oxford Scientific Films

It may seem that the members of the OSF team are always running off to exotic locations, but the truth of the matter is that many of the shots can be made more effectively on sets in the studios in Oxford than out in the wild. Shots of perch spawning could have been taken in the wild, for instance, but studio shots were far more effective and no less realistic. They have a special tank through which water can be pumped at anything up to 8,000 litres a minute. With the tank suitably landscaped, they can create anything from a stagnant pond to a raging mountain torrent at will.

There are usually several animals at the Oxford base although few stay there for long. When they need part-

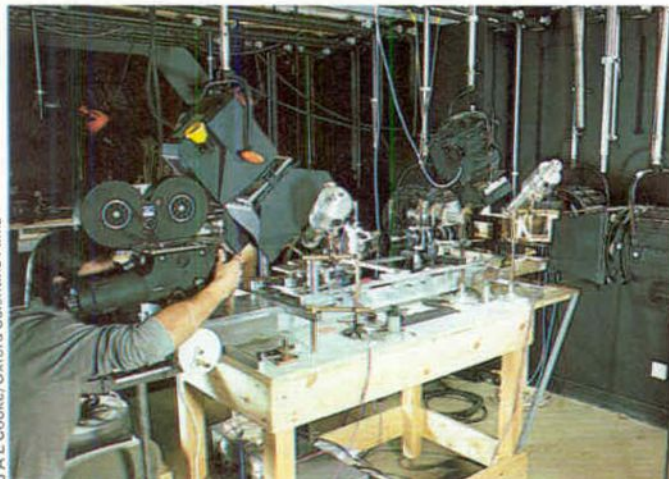
icular creatures for a film sequence, they often contact an expert and arrange to borrow specimens. For British insects, they sometimes put an announcement in the local newspaper, but in the grounds, they have a specially constructed fox's earth they can use, with a spyhole for their camera.

The essential feature of OSF is the personal involvement of all the staff and directors. The directors do not sit in their offices and commission photographers to work for them, but go out and take the pictures themselves, no matter what the conditions. As well as being an expert on spiders and an accomplished photographer, John Cooke, for instance, is now an experienced scuba diver, and so too are John

Tasty snack A very high speed electronic flash was used for this studio shot, which was triggered automatically

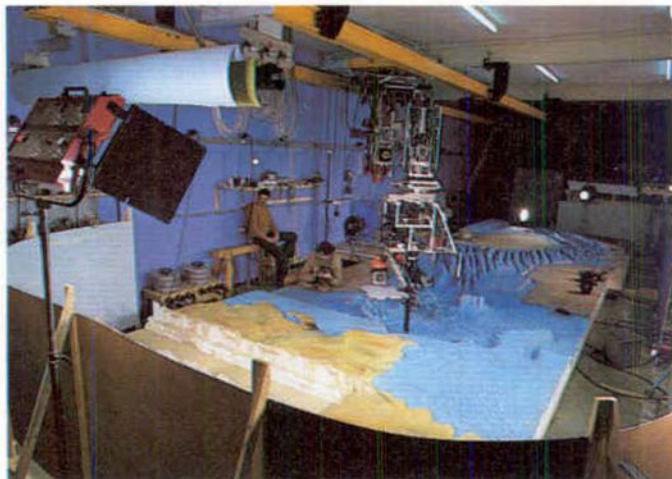
Paling and Peter Parks, the team's resident technical wizard.

According to Dr Cooke, the nicest thing about working for OSF is the opportunity to do so many different things. 'It is the diversity of the work that each of us does that gives so much pleasure.' This is only possible because OSF, despite its international reputation, is still a relatively small company. There are still only 24 staff members and John Cooke feels that they must fight against expansion, despite the temptation. 'If we expanded, we would have to specialize more and our work would change.'



J.A.L. Cooke/Oxford Scientific Films

Aerial image bench In this case, two separate subjects are being photographed in the same image plane



Peter Parks/Oxford Scientific Films

Cosmoglide Here shown over a model of the Atlantic seabed, this works like a periscope in reverse

Which film?

Choosing the right film need not be as difficult as it seems: despite the fact that the choice of brands and names seems to be limitless, there are only three basic types of film available

The range of film types available often seems bewildering. When faced with a choice between different films, each with its own peculiarities, there is a great tendency to simply stick to one well-tried type and not experiment.

This can be a big mistake. Although it is a good idea to get used to one film type before you branch out, so that any variations in results are definitely due to yourself and not the film, after a while it is worth looking at the choice available.

The choice breaks down into three categories—colour negative, colour transparency and black and white. Everybody is familiar with the appearance of negatives—with the light parts of the image appearing dark and vice versa. While black and white negatives appear with black images on a clear background, colour negatives usually have an overall orange colour, with the images in colours different from the originals—a red object appears greenish, for example. The print that is produced from negatives is sometimes called a *positive* copy.

Transparencies or slides are also positives, but are produced directly from the original material by a process of *reversal*. The film is first processed to give a negative, then immediately reversed in its tones to give a positive. The continental name for slides is *diapositives*.

Colour negative films

By far the most popular type of film in use is colour negative film. The negatives, once processed, are used to make colour prints of whatever size is required. This accounts for the popularity of negative film—the results are easy to handle. For most people, processing is simply a matter of taking the film to a shop which sends it to a laboratory to be processed. The negatives and the prints can then be collected a day or two later.

It is possible for the enthusiast to develop and print colour negatives, and the process is not particularly difficult. But unless you intend to do a great deal of printing, or enjoy the darkroom work involved, it is easier to leave the job to the developing and printing firms.

One advantage of negative film is that any number of copies can be made from

Holiday snaps Negative film does not need careful exposure metering, and is most suitable for casual photographs taken over a long period of time



Colour negatives If you want cheap prints, these are the best choice

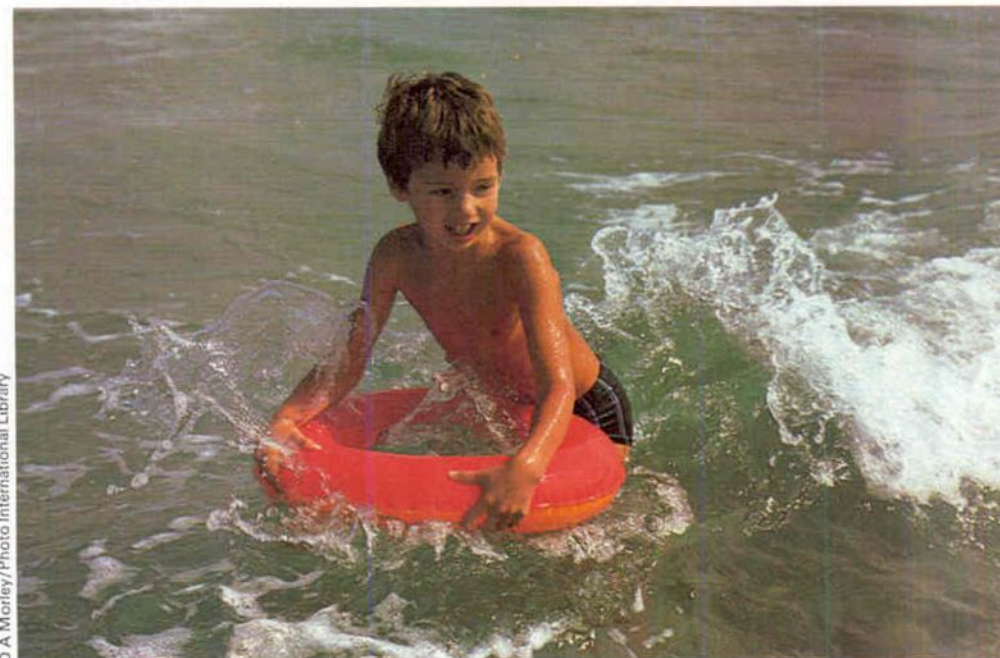


Colour transparencies Better quality but viewing is not as easy

the negative, all to the same quality. This means that not only can you send copies to people but, should you lose a print, you can always get another made from the negative which you can keep safely out of the way. Even if you lose the negative, it is still possible to get copies from the surviving print. This is an advantage not enjoyed by users of colour slides.

The exposure *latitude* of colour negative films is extraordinary—that is, they can tolerate under- or overexposure and still give printable negatives. With heavy overexposure, the colours may change, but there will still be an image on the print. Tolerance to underexposure is much lower, so it is a good idea to give the film too much light rather than too little. There is also considerable leeway as regards the lighting conditions in which pictures can be taken. Though the colour of daylight is much bluer than the colour of domestic light bulbs, for example, it is possible to use many of today's colour negative films in any kind of light, and still get prints that are acceptable.

This versatility is also the source of the major disadvantage of colour prints. The colours that they give are the result of the way the print is made, and a negative can be printed to appear generally too blue, or too green, or any other colour. This allows flexibility, but it also means that it is possible for the prints to give the



D A Morley/Photo International Library



A Pettit/Atlas Photo

wrong colours entirely. This can easily happen when the prints are made on the automatic machines used in d & p firms.

This kind of problem will only occur in extreme cases, and generally the quality of machine printing is quite high. Should you require really good prints from your colour negatives, many laboratories offer a de-luxe service, which can produce superb prints, at a price.

Of all the films on the market, colour negative film is by far the most easily obtained and processed. It is available in almost all countries, in all popular sizes including 35 mm and 110 and 126 cartridges. The choice of emulsions is greatest in 35 mm, but ranges from 80 to 400 ASA (ISO) in all formats.

Colour transparencies

Colour slides, or transparencies as they are more correctly called, rank second in order of popularity. The film is sometimes also called *reversal film*, as the image is reversed from a negative to a positive slide during processing.

Though they undoubtedly give the best colour, transparencies have the drawback that they cannot be handed round and viewed as easily as prints. They must either be projected or looked at through a hand viewer. If more than one person wants to see them, using a viewer becomes a time consuming business, and there are few practical alternatives to projecting them in a darkened room.

If this is not a problem, then colour transparencies present an attractive

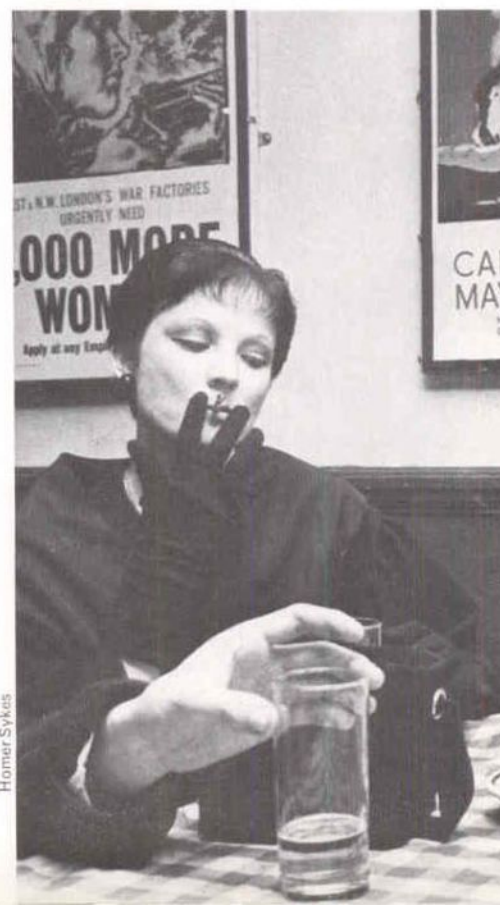
alternative to colour prints. The choice of film types is broader, with films widely available in speeds ranging from 25 ASA up to 400. The fast films can be processed to give speeds as high as 1600 ASA. In addition, there are specialist films available, some of them sensitive to infra-red light (which would enable you to take pictures in total darkness).

The cost of processing colour transparencies is lower than the cost of colour prints, as only the film itself is involved. So if your aim is to get the cheapest possible colour photographs then colour slides are the best choice. The quality of the final images is generally higher than for colour prints, because the images have only been through one process, whereas colour prints are one step further removed from the subject of the photograph. The colour quality of a slide depends only on the film. But with prints from negatives, it depends on the film, the paper, and the way the print was made. And each time an image is copied, there is a drop in quality. Though you may not think of a colour print as a copy, that is what it really is - a reversed, negative copy of the colour negative.

All the drawbacks of colour printing are eliminated with slides, but on the other hand the advantages are lost as well. The colour balance of colour slides is critical, and to get good results, it is sometimes necessary to use filters on the lens of the camera. On a sunny day out of doors, no filter is necessary, but if the weather is heavily overcast, for example, you would need a filter. Similarly, the

Colour for landscape Slides give colour that is true to life. Negatives can be more variable because of printing errors

Punchy monochrome Black and white film can sometimes give a much more striking result than anything in colour



Homer Sykes

exposure has to be more carefully judged if the slides are not to look washed out, or dark and muddy.

Almost all slide films are processed in the same way, called the E6 process, and since the printing stage is cut out, the time taken is much shorter. Some laboratories can process film within an hour. This is a great advantage for commercial work, and combined with the higher quality that is obtainable, and a number of other more technical reasons, it has led to the adoption of colour transparencies as the first choice of professional photographers.

Colour transparency films can usually be home-processed, though this does require care. Since no printing is involved, very little equipment is necessary, and home processing enables you to see your holiday pictures within an hour or two of getting home.

Typical films of this type are Ektachrome, which is obtainable in speeds of 64, 200 and 400 ASA, and Kodachrome, which although it gives the best possible quality, and has a speed of 25 or 64, can only be processed by Kodak or, in some countries, a few approved laboratories.

Virtually every type of slide film can be bought as 35 mm film, but only a small choice is available in 126 and 110: usually one film from each manufacturer.

Black and white

Though colour films occupy most of the market, b & w film still has many enthusiasts, most of whom process it themselves. Almost all black and white films give negatives, from which prints can be made. B & w printing, like processing, is easy and can be done at home.

For some people, the reduction of all colours of the spectrum to shades of grey

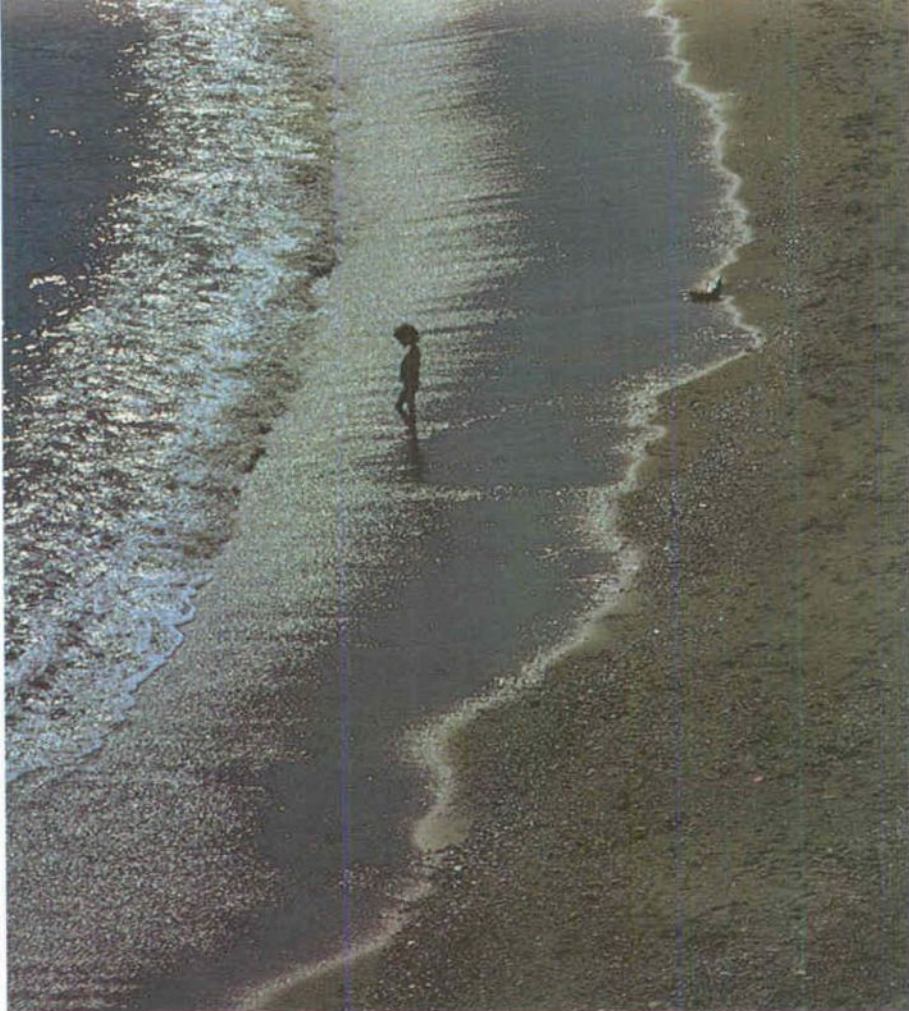
is too much of a sacrifice to make, but the rewards of working in b & w are considerable. It is easier to process and print your own pictures in monochrome than it is in colour, and costs are far lower than for colour prints or trans-

Careful colour Scenes with a wide brightness range will reproduce more accurately on transparency film

parencies. On the other hand, it is far less easy to find laboratories which will process and print black and white film, if you cannot do it yourself, and the cost may be as high as for colour.

The range of b & w films is formidable, and even for films that are in day to day use, speeds range from 25 ASA to 400. Specialist b & w films abound, with the slowest of these being only a fraction of 1 ASA used for scientific photography. At the other end of the scale, b & w films are often rated at 2000 ASA or more.

Wedding colour
Social and family occasions, such as weddings and parties, are perfectly suited to negative film. Prints are cheap and easy to get processed quickly



T. Aotani/Atlas Photo



Angela Murphy



Creative approach

Candid photography

People can be the most fascinating subjects of all. But taking candid photographs requires diplomacy and understanding as well as a practised eye



Posed deliberately in front of the camera, nearly everyone becomes a little self-conscious. For this reason, many people feel that the only way to get natural and totally candid portraits is to catch people by surprise or, better still, without them knowing at all.

By exploiting the ability of the modern camera to freeze an instant, men and women can be pictured going about their lives in their normal environment, and fleeting expressions or moments of human drama can be transformed into striking permanent images. Taking pictures of people without their knowledge may seem a little unfair, but it certainly produces some fascinating results.

The word 'candid' means, literally, 'frankly truthful'. Related to photography, however, it has come to mean 'unposed', and candid photography can be approached in one of two ways. You can either go out deliberately to provoke a reaction and attract your subject's attention. Or you can try to avoid being noticed at all and try to capture life as it happens.

The fascination of the first approach is capturing people's snap response to the camera, whether it be surprise, hostility or laughter. It is an ideal way of taking informal portraits of friends and family, and many shots of this type are taken by framing up the subject unobtrusively, attracting their attention and then shooting. But it can also produce dramatic results in less familiar situations.

Surprise photographs of strangers, for example, can produce a whole variety of interesting responses. Strangers will react to the camera in different ways. Some will enjoy the attention and play up to the camera. Others may be resentful and sullen or even aggressive. Some may simply be surprised. Whatever the response, though, the results can be very revealing.

Reaction shots

Because most people react positively to the camera—if only to positively ignore it—press photographers and photojournalists often use this technique to portray people in their own environment. If, for instance, they want to illustrate life in a really depressed urban area, this sort of reaction shot often gives the impact that the photographer wants. It might be that the surprised or aggressive look on the subject's face is simply a response to the suddenness of the camera's intrusion, but the result conveys the tough environment far more strongly than any posed photo would.

In its extreme form, this sort of photojournalism becomes posed rather than candid and many colour supplement pictures are taken by placing the subject deliberately in his or her natural environment. A shepherd, therefore, would be photographed against a back-

Girl in a window Washing-lines across the subject are usually distracting, but here they add to the natural look and to the moodiness of the picture



Homer Sykes

ground of sheep and green hills, a docker against ships and cranes and an architect against his own buildings.

The kind of response depends to a considerable extent on the photographer. An aggressive, impatient photographer will generally get a similar response and may be lucky if the hostility is only recorded on film. Unless that is the sort of photo you want, then you should behave with consideration towards your subject and remember that you are indeed intruding.

Whatever the response, though, these reaction shots are, to many photographers, rarely candid—truly candid shots are only taken when the subject is

totally unaware that there is someone around with a camera. People are pictured doing normal things—sleeping, waiting for a bus, talking in the streets, buying the groceries—in their natural environment. The idea is to show people as they really are or to capture a fleeting moment of humour or pathos, anger or kindness. The camera must be a detached and totally unnoticed observer. The photographer's job is never to arrange the subject; but simply to spot the situation 'frame up' and decide on the moment to capture the situation with the maximum impact.

Shooting unobserved

This sort of picture can be taken anywhere—the only essential ingredient is people. As long as there are people around, there is potential for a candid shot. Crowded places naturally provide plenty of scope, but an isolated figure can often provide a poignant subject. But it is important that the photographer remains largely unobserved, and it helps if people are absorbed in their own activities rather than ready to look round at the first click.

Taking candid pictures unobserved on a crowded rush hour station, for instance, is generally fairly easy because everyone is concentrating on getting home. Unfortunately it can be difficult spotting potential subjects and getting them in focus in the fast moving crowd.

On a crowded beach, on the other hand, there is much less movement, but people are less absorbed in what they are doing. Not surprisingly, many candid beach pictures just show people asleep

Lady Candid photographs can be direct and revealing portraits, but shots like this require an eye for an arresting face, a gentle approach and a sure technique

in deck chairs or reading newspapers. Places where movement is slow or predictable but where everyone is sufficiently absorbed to leave the photographer unobserved make the best locations for candid photography. Markets have plenty of potential. So too have crowds at outdoor events.

Candid pictures often tend to be of older people or are set in working class urban districts. This is not necessarily because such subjects are more photogenic, but often because they are easier to photograph. In areas of densely populated terraced housing, there are usually plenty of people walking around; in affluent and spacious suburbs, the few people around tend to be in cars. Old people are similarly easier to photograph because they are generally slower moving and have more time to stop and pass the time of day with friends in the street. And while young people tend to be much the same the world over, older people often retain local dress and traditions.

Again, while candid shots are to be found anywhere at any time, there are occasions when it is easier to shoot unobtrusively. In summer, plenty of people are on the streets and there are many potential subjects. In winter, on the other hand, there are fewer people around, but you tend to be less obtrusive, particularly if you wear a heavy coat to conceal your camera. It is possible to stand shooting for hours on a street corner on a gloomy winter's day without anyone noticing, but you will be spotted instantly in your shirt sleeves in the summer sunshine.



A bird on the head Children make ideal subjects for candid work, so when out with children keep your camera prepared for amusing moments



Homer Sykes

Washing the pony People absorbed in some task are again ideal for candid shots and you often have time to compose your picture leisurely and properly

help you become accustomed to the idea of taking impromptu shots of people before you try your technique on total strangers.

It is often thought that the best way to take candid pictures without being noticed is to use all sorts of elaborate equipment—concealed cameras, sub-miniatures, telephotos—but these are usually unnecessary. Indeed, people are understandably suspicious and resentful of these 'sneaky' techniques and in some countries the surreptitious use of a miniature camera can be positively dangerous. Some people suggest that a twin-lens reflex camera, of the sort traditionally used by wedding photographers, held at waist level is the ideal for candid work because it is much less obvious when you shoot. But you can generally take pictures much faster with an SLR, and an eye-level viewpoint is generally more pleasing, although it may be worth bending down or shooting from above to create a bit of variety.

There is one drawback to using an SLR, however, and that is its noisiness. While it is very useful to be able to focus quickly and accurately, the system that allows you to do this, with a mirror that must flip out of the way before the

Crowd shots Spectators at a sports event make good subjects—they are usually too absorbed to notice cameras. Try to concentrate on a few faces

But wherever and whenever you go out to take candid pictures, it is important to attract the minimum attention. Bright, flashy clothes are clearly out, but so too is a flashy, aggressive manner. The best candid shots are taken not by a cartoon-image loud, khaki-clad press photographer bristling with lenses and equipment, but by the quiet observer.

If you cannot help being noticed when you arrive at your location, wait for a while and let people get used to you and your camera before you start shooting in earnest. Unfortunately, you will rarely remain unobserved for long and even if your subject does not react, other people, may interrupt your activities. If this happens, you must be patient and polite—any sort of argument will ruin the

situation—and carry on shooting if possible.

Many photographers avoid candid photography because they find it embarrassing, particularly if they are noticed. There are no easy answers to this problem and it is up to the individual photographer to overcome it. However, many of the most experienced candid photographers suffered from self-consciousness when they started and gaining confidence is largely a matter of practice. Nevertheless, it may be worth going along to the local amateur dramatic society to take pictures during rehearsals. Obviously you must get permission first, but most actors and actresses will be only too pleased to have their performances on film. This should



Sally and Richard Greenhill

Henri Cartier-Bresson/Magnum



Hair today? Photographs like this need a keen eye for humour and an ever ready camera—this belongs to the master of the candid shot, Henri Cartier-Bresson

picture can be taken, gives a noticeable click as you press the shutter.

Some SLRs are less noisy than others, but quietest of all are non-SLRs which do not have mirrors or focal plane shutters. This is where compact cameras come into their own, since they generally have comparatively silent leaf shutters. Twin-lens reflex cameras, of the sort mentioned above, also have leaf shutters and offer the additional advantages of accurate focusing and interchangeable lenses.

Speed is perhaps the most important factor in candid photography—not so much the shutter speed or the speed of the film, but the speed with which you can decide on the framing, focusing and exposure, and take the shot. Any time lost here may lose you the picture or may give your subject time to see you. Automatic exposure and focusing certainly help in this respect, but neither of these will make much difference if you are not alert or, more significantly, unfamiliar, with your equipment. It is essential to be completely at home with your camera if you are to operate quickly and unobtrusively. Seconds spent fumbling with the focusing and

aperture can only help draw attention and may prove embarrassing. The famous candid photographer, Henri Cartier-Bresson, once claimed to be able to adjust the focus, aperture and shutter speed while the camera was still in his pocket!

In fact, it is rarely necessary to readjust all the settings for each individual shot. When you go out for a day of candid photography in a particular location, the same settings will probably be adequate for most of the day, unless you go into dark shadows or shoot from extremely close quarters. On a bright, cloudy day outdoors, for instance, a setting of $f/8$ at $1/125$ of a second will give the correct exposure in most candid situations. It will also give you reasonable depth of field and you can be sure that if you set the focus to around 3 metres, or whatever the average shooting distance is, your picture will probably be sharp.

Candid lenses

There is something to be said for all focal lengths and lens types. A telephoto will allow you to fill the frame without getting too close and may get you pictures of inaccessible subjects, but the result will look as distant and detached as indeed you are. Pictures taken with a standard or wide angle lens are far more immediate and involved, but have to be

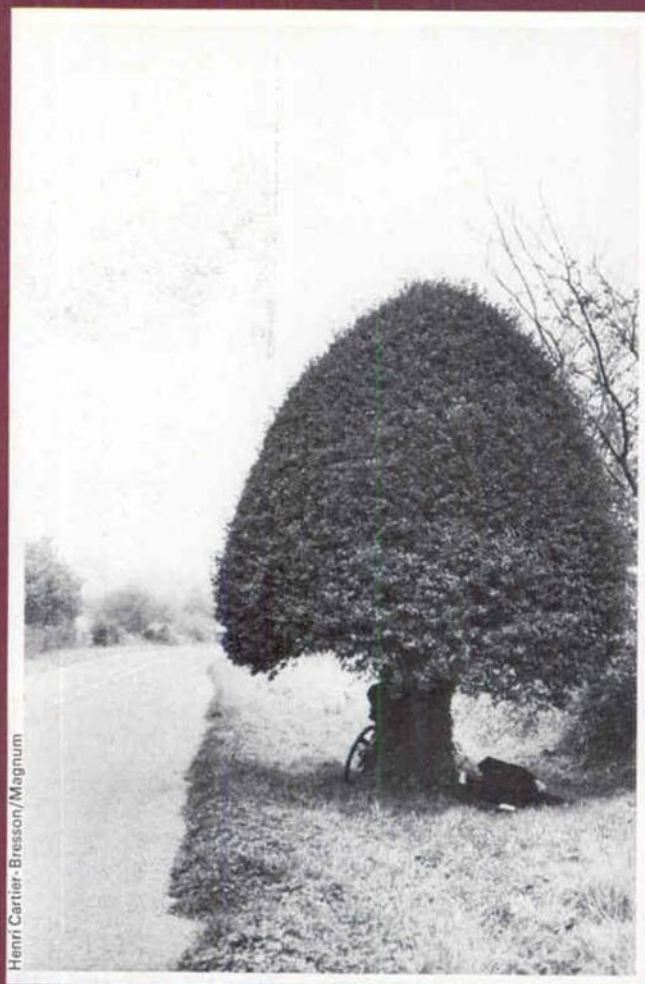


L.L.T. Rhodes/Daily Telegraph Colour Library

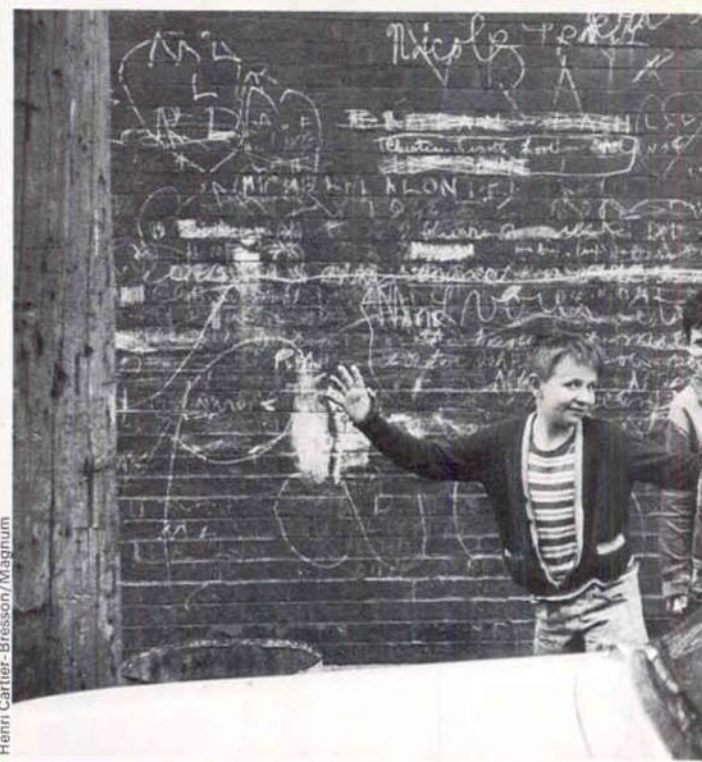
On the beach With people at play and plenty of light, crowded holiday beaches provide plenty of scope for catching revealing moments on film

taken at a much closer range. Nevertheless, you may be able to photograph someone with a wide angle lens even if he sees the camera if you only include him or her at the edge of the frame—people rarely believe they are being photographed unless the camera is pointing straight at them. Furthermore, such a lens will include some background—often invaluable to help place subjects in their normal environments. Most professionals are happiest with a standard lens, or a 28-50 mm zoom, and only use a long lens when absolutely necessary.

However you tackle candid photography, you must remember that not everyone appreciates having their picture taken, particularly if the result could be embarrassing. Indeed, it is well known that some people, such as the African Masai tribe, find it highly worrying. The Masai believe that if you take their picture you take away their souls—though they may accept financial compensation. Either way, you must consider the feelings of the people you photograph. It might be a nice gesture to offer them a copy of your final shot.



Henri Cartier-Bresson/Magnum



Henri Cartier-Bresson/Magnum

By the roadside Black and white is often the best medium for candid work—shots like this would lose all their impact in colour. So when out shooting candid, try loading b & w film

Jubilee day Many candid shots exploit visual association—here it is between the stern portrait of the queen and her crown, and the rather grim-faced woman and her hair-net



Ian Berry/Magnum



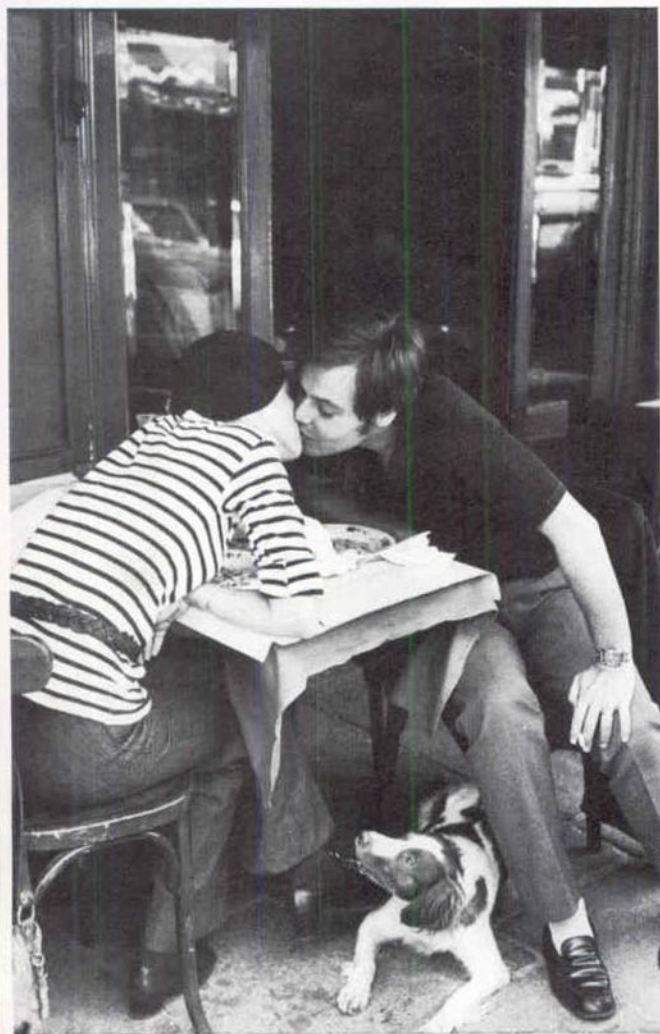
Children larking *The fascination of surprise shots is the variety of response to the camera. Here the boys play up mischievously*

Couple kissing *Always look for little details in the frame—it is the bemused gaze of the dog that makes this picture something out of the ordinary*

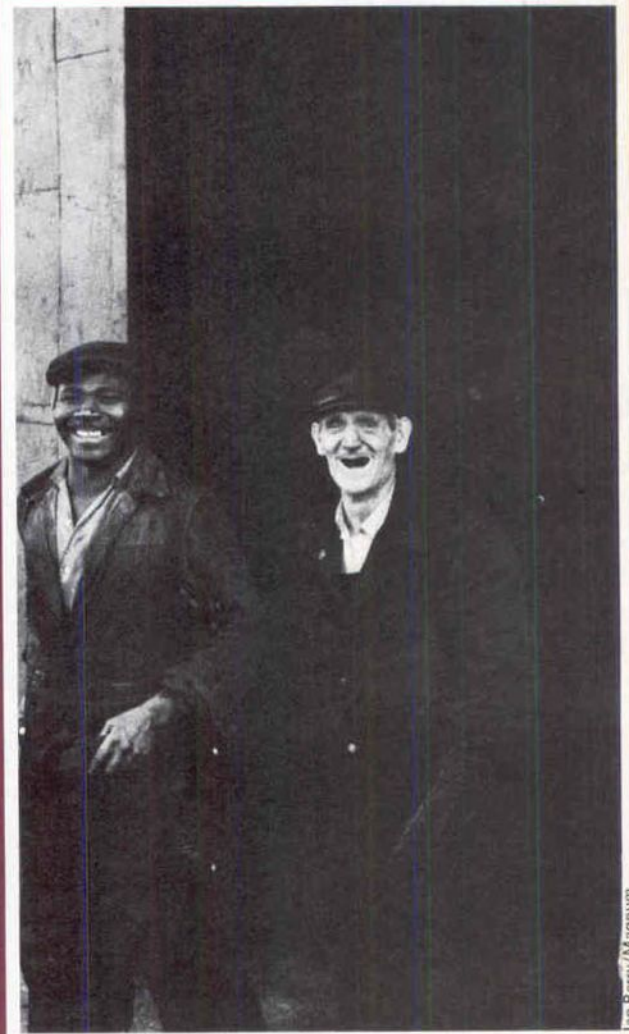


Sheepdog trials *Wet weather provides an ideal cover for the photographer and you can often shoot unnoticed and unhindered if you are discreet*

Going home *If you spot a good location, set your camera up and wait for people to move into the frame. Prefocus on a particular spot to avoid fiddling later*



Henri Cartier-Bresson/Magnum



Ian Berry/Magnum

Better film processing-1

Unless you make absolutely sure that your technique for processing film is sound from the start, you may not get the most from your photography—and you also risk spoiling your pictures completely

Processing a black and white film is the simplest of all photographic processing techniques. You need little in the way of equipment and the whole procedure, apart from loading the film in the tank, can be carried out in normal room lighting. Getting top-quality results, however, depends very much on the attention paid to each individual stage of the process: sloppy technique invites trouble and the possible loss of your pictures.

Equipment preparation

Before you use any equipment, check it to make sure that it is clean enough for use and that it has not suffered any damage during storage. Plastic storage bottles and containers can crack—so can the body section of a plastic developing tank. Check these against the light. Make

a point of rinsing out the measuring cylinder and solution containers before use. Other equipment should only need a quick wipe down with a damp cloth prior to use if it was clean when put away, as it should have been.

Use common sense when force-drying any plastic equipment. A fan heater or hair dryer can be a real time-saver, particularly for spirals which cannot be dried with a towel. Never attempt to load film in to a wet spiral or tank: not only do you face the prospect of a jammed or damaged film, but there is also the risk of marking or splashing the film so causing processing faults which will mar the quality of your negatives.

If you do have to rinse the tank spiral before use, you can speed up drying by removing any water trapped in the spiral grooves. The easiest way to do this is to



A Always lay out the various tank components in the same, logical order so that you can find things easily in the darkness when loading

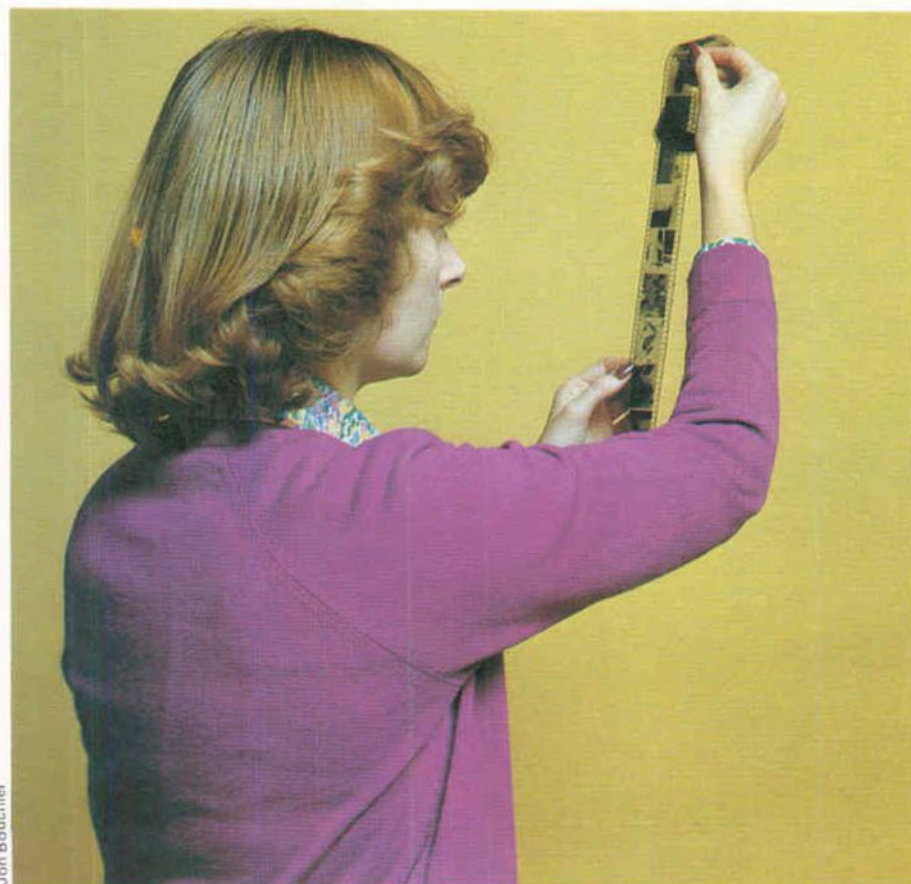
run a corner of a fold of cloth or tissue along the grooves. Once surplus water is removed, you can use a fan heater for drying the spiral.

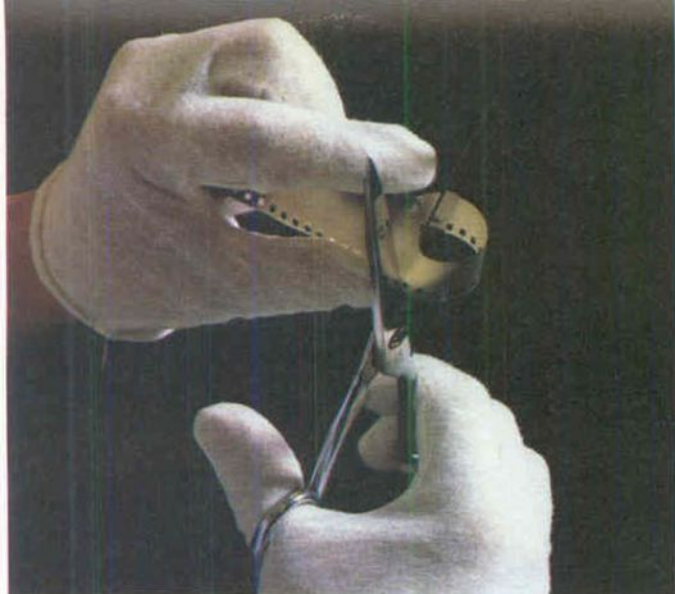
Black-out conditions

Because film is extremely sensitive to light of all colours, you must load it into the developing tank in total darkness. If light strikes the film before or during processing, fogging may occur. In the case of b & w film, even small amounts of fogging—evident as perhaps only a slight greying of the negative—can significantly impair image quality. Negatives become difficult to print, and it may be impossible to get a good, rich black in the print.

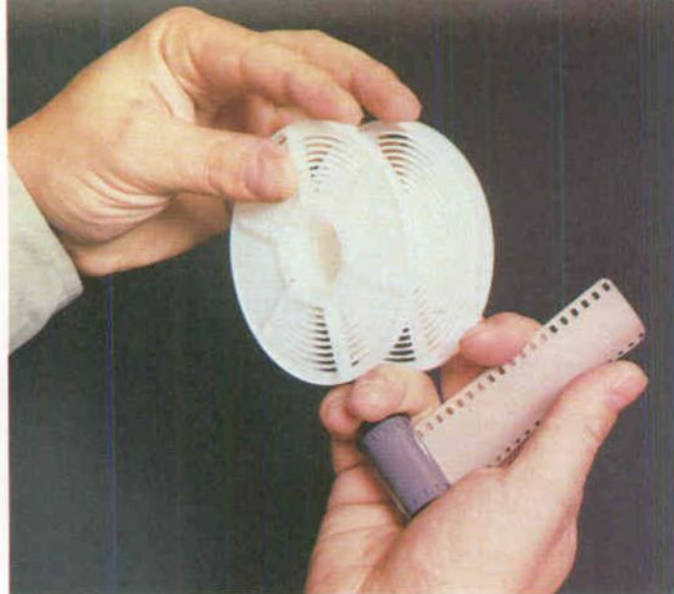
If you are loading in a darkened room, check that it is indeed dark. Eyes are surprisingly sensitive if you give them time to adapt to conditions of darkness, so wait a few minutes when you put out the light. If, after this time, you cannot see

Moment of truth You inspect your negs, just processed. Are they in perfect condition, or has something gone drastically wrong?





B If your hands tend to sweat, fingerprints and streaks can be prevented by wearing cotton gloves made for this purpose



C Hold the spool of unloaded film firmly in the palm and form a 'U' section. Carefully locate this in the feed mechanism

Jon Bouchier

your hands in front of your face, conditions are likely to be suitable for loading film.

Never attempt to load if it is possible to distinguish the shapes of objects, particularly by reflected light. Very slight light leaks can be shielded by your body, but anything stronger must be masked off with suitable tape or baffles.

If you wait till nightfall to load films, bear in mind the presence of street and traffic lights. Warn others in the household not to switch on lights near to where you are loading if the light-proofing is suspect.

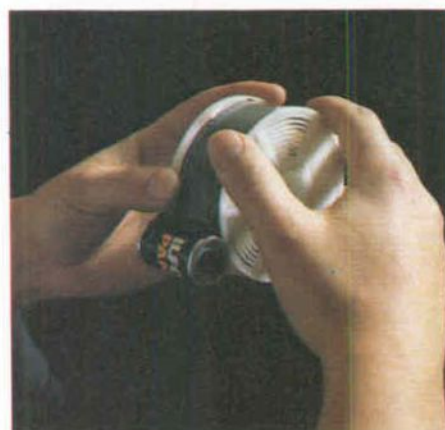
If you have to use a changing bag for film loading, shake it out well to remove dust and film debris which may cause problems during loading or processing. Check the seams from time to time, particularly in the sleeve regions where wear and tear is most likely. Check also for small pin-pricks and tears in the outer layer, and tape them over.

Loading film

Impatience is the cause of many of the problems associated with film loading. Everybody experiences problems of this sort at some time or another, no matter how many 'dry runs' they have done in full lighting. Always anticipate hold-ups or more severe problems, and keep a light-tight container at hand so that a troublesome film can be put aside while you collect your thoughts in the light and fresh air. Never lose your temper with a film—as well as risking further damage to it, you will probably aggravate the problem.

Before turning out the lights, arrange the equipment and tank components in a logical order—the spiral nearest to you, followed by the tank body and the tank lid, and have scissors and any other items nearby (fig. A). Standardize this layout and you should have no difficulty locating items in the dark. You can see the importance of having a suitable work surface for loading film but do make sure this is kept scrupulously clean and dry.

Before handling the film, wash your hands to remove chemicals, sweat and



body oils which can transfer to the emulsion side of the film. Always try to handle film only by its edges so that handling faults such as fingerprints and smears can be prevented (fig. B).

Before loading the film into the spiral, the end of the film must be cut square. With practice this can be done in the dark, but it can cause problems for the beginner, since it is necessary to make the cut between perforations. You may therefore find it much easier to prepare the film end in normal room lighting. So when you have removed the end cap, take out the spool and feed the leader back through the cassette light trap, replacing the spool and end cap afterwards. Switch on the light and cut off the leader just before it reaches full width. Then round off the corners so the film slides easily along the grooves of the spiral.

You can then switch out the light, break open the cassette again and proceed to load the film. Alternatively—providing you have taken the added precaution of cleaning the cassette light trap to prevent tramline scratches—you can load the film straight from the cassette (fig. E), in darkness of course.

The one main advantage of this method is that you do not have to handle any more than the beginning of the film, which is worth bearing in mind if your hands tend to sweat a lot. The cassette also provides additional protection from light seepage and physical damage.

You will need both hands to see-saw

D To prevent film spilling to the floor, cup and contain the spool within the palm of your hand as you rack the two sides of the spiral alternately back and forward

E For additional protection, you can load the film direct from its cassette providing care is taken to clean the light trap when retrieving the leader

F Over energetic agitation and force washing may cause the film end to slip off the spiral. To prevent any damage, simply tape the end to the film below



the two sides of the spiral, leaving the spool of film to cascade to its full length and perhaps on to the floor unless you provide a suitable support—or unless you load the film directly from the cassette. This is another good reason for choosing to unload film somewhere with a work-top. The alternative is your lap unless you cup the spool (fig. D).

Never exert too much pressure on the sides of the spiral, particularly if a film begins to stick. If you use too much force you risk stressing and tearing the film. Carefully respool the film and try again. If the problem still occurs, respool the film a second time and place it in its cassette or other suitable container while you examine and rectify the problem with the spiral. It is likely to be damp or dirty which causes sticking.

Centre-load spirals are much easier to load once the all-important technique of forming the 'U'-shaped cross-section has been mastered (see page 44). If your make of spiral does employ a special loading chute, learn to fit and use this properly. If you are loading solely by hand, it helps to keep your fingers and thumb rigid at all times so a constant 'U' is formed as the film runs through on to the spiral (fig. C).

Most 35 mm film is taped to the take-up spool. To prevent the film unfurling during processing, use this tape to hold the trailing end of the film in place against the film below, if possible (fig. F).

Now place the loaded spiral in to the developing tank and make sure the lid is correctly fitted before turning on the

G Concertina style containers are very useful for storing decreasing amounts of stock solution. Tick off the number of films processed in reusable solutions

light. With push-on lids, first remove the filler cap as air-pressure within the tank may prevent it from closing properly. One useful way to make sure that a screw-on lid seats properly is to screw it anti-clockwise a turn or so before tightening it in the proper manner.

If, in spite of all these precautions, you continue to experience difficulties in loading, examine your technique closely.



H If you are worried about the state of the fixer, find a length of film which has not been processed and see if the fixer clears this in the claimed fixing period

Once again, practise the various loading stages in full lighting to re-establish a feel for the job. Then do it with your eyes closed, and repeat it in darkness for as long as it takes to gain faultless familiarity. If necessary, buy an old outdated film to practise with, rather than risk ruining a film you have already exposed.

Mixing chemicals

Treat all chemicals with the utmost caution. Many of those employed in photography contain harmful irritants which can cause skin disorders, so the obvious precaution is to wear rubber gloves during all stages of preparation. Some chemicals cause staining and should be disposed of in a way that does not bring them into contact with sink metal or, for that matter, piping. Flush waste down the toilet or, preferably, an outside drain.

Although common sense should suggest it, always resist the temptation to open sealed packets of chemicals with your mouth: snip off the corner with scissors.

Ordinary tap water is normally quite adequate for the preparation of solutions unless the chemical manufacturers stipulate otherwise. In some areas the nature of the water (whether it is very soft and peaty, or very hard and chalky) may mean that you will have to buy or prepare distilled water.

It is not normally necessary to filter tap water unless you are persistently troubled by dirty negatives and are sure that the problem is not a result of careless handling. Old iron pipework can be a source of minute rust spots, most noticeable when embedded in the emulsion of a negative or print.

Make up solutions in a beaker or jug rather than in the storage bottle, and always add powder to water at the recommended temperature. Powder can be mixed in using a clean spatula or rod set aside specifically for the job. Do not use a photographic thermometer as this may break. Before transferring freshly mixed solution to a tank or storage bottle, filter out any undissolved particles which could otherwise settle on the film during processing.

Various types of filtering aid are available, some of the models combining a filter element inside a pouring funnel. You can make your own, though it may be less satisfactory, using an ordinary funnel and the fold of a coffee filter paper—even a wad of cotton wool stuck in the tube of the funnel is better than nothing.

The real advantage of liquid concentrate solutions is that they can be diluted as required just before use so temperature control is much less of a problem (see below). Use water a few degrees above the recommended process temperature to make up the working-strength solution—this will cool down slightly before processing begins.

Liquid concentrates have dilutions marked in two ways, 1 + 9 and 1 : 10. Both mean the same. One part of the concentrate must be dissolved in nine parts

of water, making a total of ten parts in all.

An accurate measure is essential if you are using chemicals which are highly concentrated: you may be able to obtain a medicine measure for this. When you are working out the amount of concentrate required for a certain amount of working-strength solution, round up the quantity of the latter to a figure easily divisible by the dilution sum. If your size of film requires 290 ml of solution and you are using concentrate that has to be diluted 1 + 29 (that is, making a total of 30 parts), make 300 ml. This means measuring out 10 ml of concentrate and topping it up to 300 ml.

When chemicals are mixed, store them in properly labelled bottles—dark coloured plastic ones are ideal as you can squeeze the sides to expel air before screwing on the cap. This prevents the oxidization of the developer and so increases its effective life.

You can also minimize wastage of concentrates and stock solutions by keeping these in tightly stoppered bottles of the correct volume. As you use up a solution, transfer the remnant to a suitable container of smaller size which has been properly cleaned out beforehand. A collection of plastic bottles of various sizes is worth acquiring for this job—save the ones in which the concentrates originally came.

Compressible, concertina style con-

tainers are especially useful for permanent storage (fig. G) but it is very important to clean these out thoroughly if changing from one chemical type to another, particularly with colour work.

Using overworked chemicals is another potential cause of poor quality results. If you are processing with reusable solutions, do not exceed the number of films capacity claimed by the chemical manufacturer. A figure is normally quoted in the instructions and it is a good idea to mark this on the label, knocking down the figure each time a film is processed.

A particular advantage of most forms of liquid concentrate developer is that they are intended for use on a 'one-shot' basis—that is, they are mixed to working strength (shortly prior to use), used once and then discarded. As solutions are not reused, and freshly made developer is used each time, you can get consistent results time after time. Liquid concentrate fixers are, however, reusable.

Developers in powder form are made up into reusable working strength solutions, or into stock solutions which must be diluted further into working strength solutions used on a one-shot basis. Powdered fixer is made up into a reusable working strength solution.

Do not use developer that is obviously discoloured or smelling—even if you have not overworked it, it may be old or

have been badly stored.

Developer concentrate should be clear or only slightly straw coloured when freshly opened, and must be discarded when obviously discoloured beyond this level even if the colour clears upon dilution. Working strength stock solution does become discoloured during the course of use and it is best to follow the manufacturer's guidelines on discarding this, bearing in mind the relevant points dealing with storage and use.

Fixer activity can be checked using a length of unprocessed film such as the leader removed during loading. The fixer should clear the milky appearance of the film within half the total claimed fixing time. Do not be tempted to compensate for old fixer simply by increasing the fixing period, as this can lead to further complications such as image bleaching.

To avoid contaminating one chemical with another, it is a good idea to use storage bottles of different shapes, colours and cap sizes. Be particularly careful to avoid contaminating developer with splashes of fixer, and mix this up in a well-ventilated room as the fumes are potentially harmful.

If your funds extend to it, buy a separate set of mixing utensils for each type of chemical you use. Paint, or otherwise permanently label, these for exclusive use with a particular type of chemical.

Preparing solutions

The main difference between 'one-shot' concentrate chemicals and those made up from powder form is that the latter are nearly always reusable.

The mixing procedure for making up powder solutions (right) starts with measuring off warm water that accounts for about two-thirds of the eventual volume of liquid. Powder is added to this, and stirred until fully dissolved, whereupon the stock solution is topped up to the full volume. The stock solution is then stored. If this is a reusable solution already at working strength dilution (and correct temperature) it can be poured straight into the tank for use, and back again afterwards.

By comparison, the mixing procedure for liquid concentrates (below) is based purely on demand: the required amount of concentrate is measured off accurately and water of about the correct processing temperature added to make up the correct amount of working strength solution. This can be brought to the correct temperature, used, and then discarded.



Focal plane shutters

Built into every modern camera is a shutter, to control the time the film is exposed to light. Focal plane shutters are fitted deep in the camera body, and make possible speeds as brief as 1/2000 sec

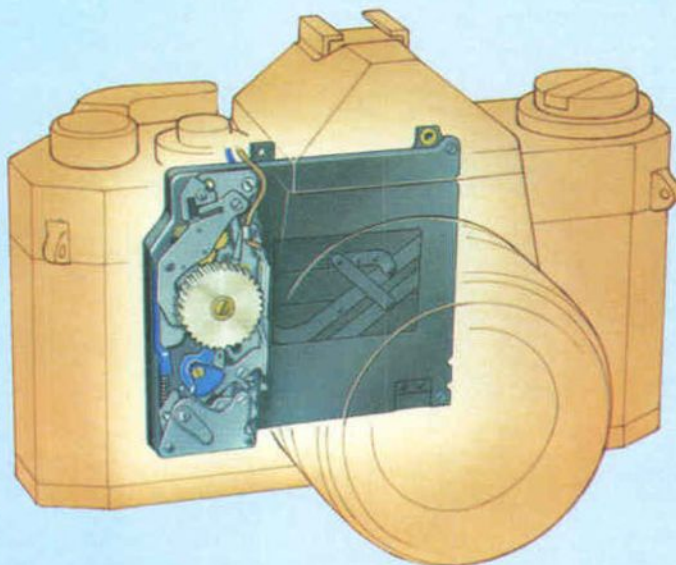
The job of regulating the exposure time for a picture is done by the shutter. Its mechanism has to keep the film frame in total darkness until the precise moment that you take the picture. For most of the time it is possible to ignore the way a shutter works, but occasionally problems crop up because the photographer did not understand the system being used.

Early cameras did not need a separate shutter mechanism since the photographic material was slow and the lenses used had very small apertures. Exposure times were so long that a few seconds error made no difference to the final result. It was enough to remove the lens cap for a timed period to make the exposure.

With the arrival of faster films and lenses, the function of a camera's shutter has become much more critical. Exposure times have been reduced from hours or minutes to fractions of a second. Some camera manufacturers now use shutters with speeds as brief as 1/2000 second. The demands made on the mechanisms are critical—they must expose the whole frame perfectly evenly and repeatedly.

There are two possibilities when it comes to siting a shutter. One is to fit a *leaf shutter* inside the barrel of the lens, between the lens elements. In this position, the shutter is defocused so that its opening and closing movement gives an even illumination across the film frame.

Metal blade shutter This focal plane shutter is made up of several thin, flat blades of metal. These move apart to expose the film to light passing through the lens



SLR cameras In a 35 mm single lens reflex camera, the shutter lies close to the film at the back of the camera. This makes interchangeable lenses easy to fit, and cheap to manufacture

Leaf shutters are used in most compact cameras as well as in larger cameras. This type of shutter mechanism is described in detail in the next article in this series.

The second alternative is the *focal plane shutter*. Almost all modern 35 mm SLR cameras use this type of arrangement although there are many different variations

on the basic design. It consists of two rubberized fabric or metal blinds which are mounted as close to the film plane as possible. In this position they can expose the frame evenly and can be arranged to give consistent, repeatable exposures for each frame of film.

Winding on the film on an SLR camera cocks the shutter

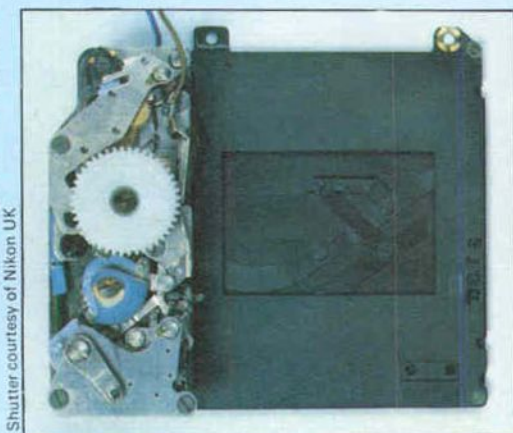
ready for firing—that is, winds the blinds back to their starting point for the exposure. When you press the shutter release, the first of the blinds moves across the film, closely followed by the second. The gap between them makes a progressive exposure as it travels and the result is a consistently exposed film. Usually the speed of movement of the blinds is constant—it is the width of the gap between them which is varied to give the different shutter speeds.

Slower shutter speeds are usually made by opening the whole shutter curtain at once. The second blind is held back while the whole frame is exposed.

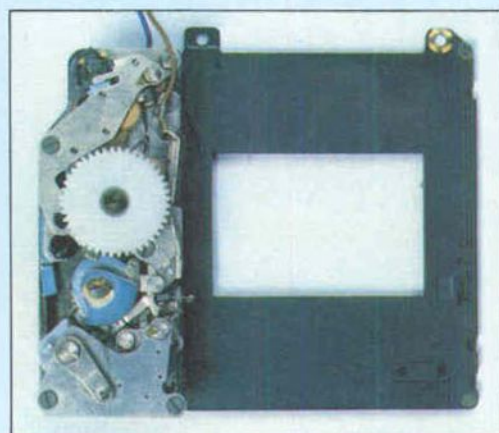
Horizontal and vertical run shutters

The most common type of focal plane shutter has rubberized fabric blinds which run across the frame horizontally. With this type of mechanism, after the shutter release button has been pressed, the blinds move across the frame taking about 20 ms (1/50 second) to travel the full length of the frame.

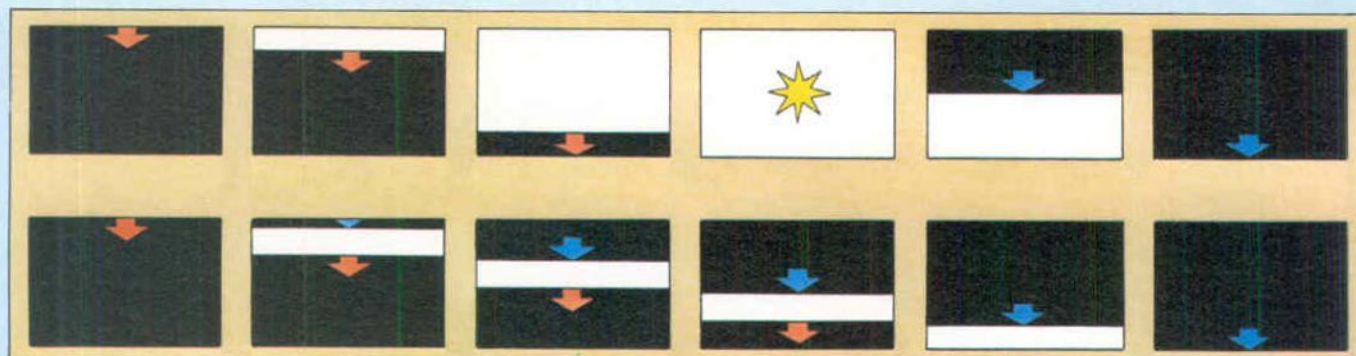
The gap between the two blinds varies to give the



Shutter courtesy of Nikon UK



Jon Bouchier



Paul Williams

Slow speeds At shutter speeds of $1/125$ or slower (top), the shutter uncovers the film completely before beginning to close. If flash is used, it will fire when the shutter is fully open

different exposures (above), so the narrower the gap the shorter the exposure. The leading blind, the first to begin its movement across the film frame, has an oblong aperture which is slightly larger than the area of the frame. The blind which follows it has a slightly smaller aperture and, being independent of the leading blind, is connected by narrow tapes to a spring-loaded drum.

Both of the blinds move independently in one direction only and are returned jointly to their original positions when the film is wound on to the next frame.

Milliseconds

Since fractions of a second can be inconvenient to handle, shutter timings are often measured in milliseconds (abbreviated ms), which are thousandths of a second. $1/50$ second is 20 ms, while $1/1000$ second is 1 ms.

Metal shutters perform exactly the same function although the mechanics of the operation are slightly different. Instead of cloth blinds, these have metal blades which run vertically across the short side of the film frame. Having less distance to travel, the blades of these vertical run shutters cross the film quicker than horizontal blinds, even if they move at the same speed. It is said that these shutters are more robust and less vulnerable in damp conditions, but in practice the big advantage of this mechanism is that it allows a higher flash synchronization speed.

When flash is being used, the shutter must be completely open as the flash fires. At high shutter speeds, the whole frame is never fully

open at any time—only the gap between the blinds exposes the film. So a flash exposure at a shutter speed faster than $1/60$ on a horizontal run shutter will not expose the whole frame but only a strip. With vertical run shutters, however, the whole frame is still open at a speed of $1/125$ sec.

A mechanism which oper-

Fast speeds At $1/250$ or faster, a narrow slit moves quickly across in front of the film. Since the whole of the frame is never exposed to light all at once, flash cannot be used

ated even faster, with each blade crossing the frame in 4 ms or less instead of the 8 ms or so of a normal vertical run shutter, would permit an even faster flash speed of $1/250$.

Fast flash speeds are useful when combining flash with other lighting—such as fill-in flash, which is the use of flash during daylight to fill in shadows near the camera.

Electronic shutters

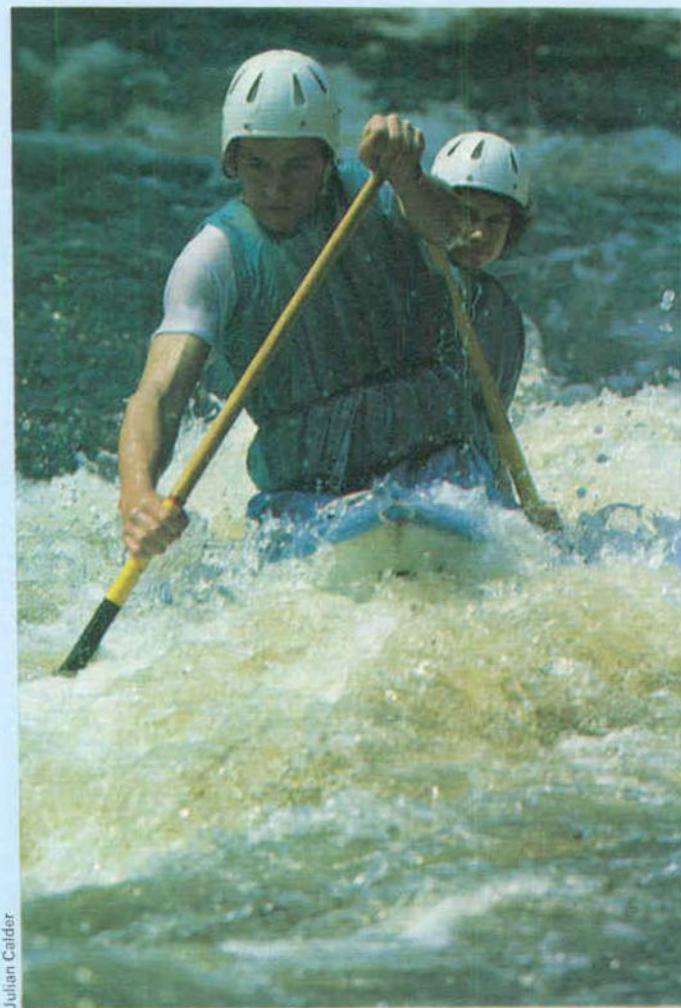
Although people often speak of cameras with electronic shutters, this term is misleading since the movement of the shutter is still mechanical. The timing of the duration is electronic and the second shutter blind is released by an electrical signal.

The blinds are operated by electromagnets, which are controlled by electric current. All the timing and control can therefore be done electronically, using microchips, rather than by the clockwork mechanisms of purely mechanical shutters.

The advantages of 'electronic' shutters are their high accuracy and the way they can be controlled electronically, which allows programmed exposures which are calculated by a simple computer. Their drawback is that they need batteries to operate them, which means that they usually work at one speed only should the batteries fail. Some shutters have both electronic and mechanical timing, to avoid this, although few shutters offer as wide a range of speeds in the mechanical mode as they do when the speeds are electronically timed.

The SLR shutter mechanism

The focal plane shutter, in all its various different versions, is the ideal mechanism for an SLR camera. Since the shutter is in the camera body, rather than in the lens, any lens can be used on the camera without needing its own shutter mechanism. As interchangeable lenses are one of the major attractions of SLR cameras, it is important that uncomplicated and relatively inexpensive lenses are widely available.



Julian Calder

Stopping action Where very fast speeds are required, the focal plane shutter is unrivalled. A shutter speed of $1/2000$ sec was needed to freeze the action in this picture



Improve your technique

What do you focus on?

Often it is an easy matter to choose which part of a scene to focus on, but when an unusual picture crops up the decision can become a lot more complicated



Trevor Wood

When you first start taking pictures, your only thoughts about focusing are probably along the lines of 'Is it in focus, or is it out of focus?' But it does not take very long before you begin to realize that focusing a camera is not quite that simple. Unless the subject is distant scenery with nothing in the foreground of the picture, there will always be some objects which are closer to the camera than others. Under most circumstances, this means that it is necessary to make a decision about which part of the scene is to appear most sharp on the film.

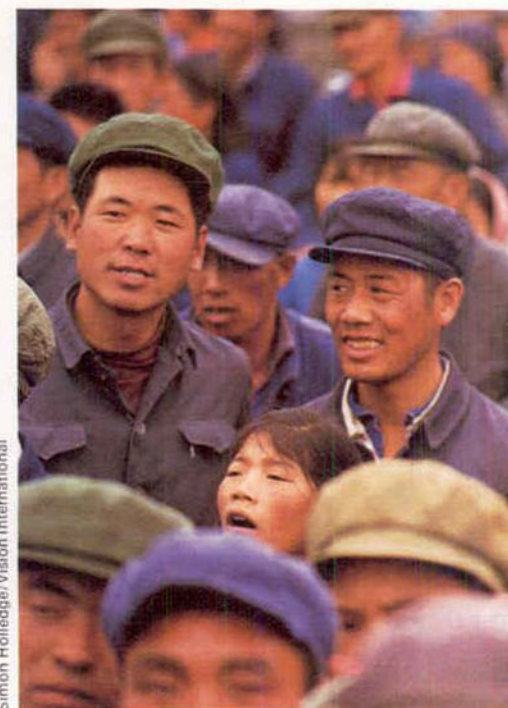
In simple cases, such as a figure standing against a nondescript background, the decision of what to focus on will be simple—you can just focus on the figure. But in a more complex situation, where no one part of the subject seems more important than any other, and there is not enough depth of field to include everything.

The way you focus the camera will depend on what the picture is for, and which part of the picture is most important. For example, the kind of photograph that an archaeologist requires of Pompeii will be altogether different from the picture that a holidaymaker may take of the same subject. The archaeologist will need a picture that gives the maximum amount of information about the buildings and the setting, whereas someone who is seeing the sights is more interested in

Houses Attention is drawn to the houses by throwing the foreground out of focus—selective focusing emphasises detail

Chairs Careful use of the depth of field and focus point allows comprehensive focus of near and far objects

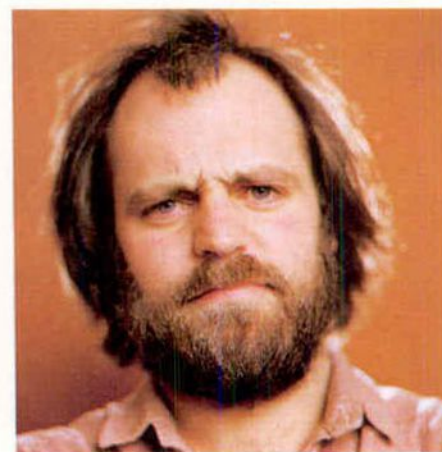
Crowd Isolating a figure. By focusing on a single figure, it is possible to pull one face out of a large crowd



Simon Hollidge/Vision International



Eyes in focus Where there is not enough depth of field to keep the whole face in focus, focusing on the eyes alone does usually produce an acceptable portrait



Jon Bouchier

Unsharp eyes On the other hand, a portrait in which some other part of a sitter's face is in focus, and the eyes are not, tends to look distinctly odd



taking a picture which will bring back the atmosphere of the place, than in creating a strictly literal interpretation.

These requirements will dictate what the two photographers choose to focus on. The archaeologist will try to make sure that absolutely everything in the picture appears pin-sharp on the film. He might do this by estimating the distance to the nearest point of the picture, and to the most distant part of the scene, and then consult the depth of field scale on the camera lens to focus on a point between these two distances. When the lens is stopped down to a small aperture, both near and far points will be in focus.

The kind of picture that is suitable as an accurate, scientific record will, however, often look out of place in a picture album. Such pictures are often sterile and lifeless, despite their technical perfection. In photographing the same scene, a tourist may well spot a particularly interesting feature of a building and decide to emphasize this, rather than concentrating on getting everything perfectly sharp. In this case, it would be best to focus carefully on the feature that

is to be the centre of attention, and use a wide aperture to restrict depth of field.

What you focus on will depend on which part of the picture is most important, and what you wish to include or eliminate. Do not forget that those parts of the picture which are unsharp are not necessarily wasted. You can use out of focus portions of the image to frame a part of the subject that you wish to emphasize, or to provide an impression of depth in the picture.

The way you focus the camera, and how much of the picture is in focus, can be broadly divided into *selective focusing*, where you use shallow depth of field to isolate the subject, and *comprehensive focusing* where maximum use is made of the available depth of field.

Selective focusing

It is always necessary to be selective in focusing, so this term is misleading, but it is generally taken to mean the use of shallow depth of field to isolate or emphasize the subject. This may be a decision that is taken for a specific reason—such as a distracting back-

ground to the picture. It may be forced upon the photographer, for example by poor light where it is not possible to close down the aperture of the lens to produce greater depth of field. The subject may be moving quickly, so a fast shutter speed is needed. In order to give adequate exposure, it would be necessary in this case to use a wide aperture.

All modern SLR cameras focus at full aperture, so the image in the viewfinder when you are taking the picture will be more selective than the final picture. Unless you are taking photographs at full aperture, there will be more depth of field when the lens is closed down to the working aperture. If you want to produce a blurred foreground or background, then it will be necessary to close the lens down in order to preview the depth of field. Most manual and semi-automatic SLR cameras allow you to do this, usually in the form of a catch or switch on the camera body. When pressed, this closes down the lens to the working aperture. If you are using a viewfinder camera, there is no alternative to using the depth of field scale.

When shooting portraits, it is very useful to be able to eliminate a background, particularly if the pictures are taken in a city setting where it is often difficult to find an attractive backdrop against which to take the pictures. A telephoto lens (which has very shallow depth of field) will do this more effectively than a standard lens, and the opposite applies to wide angle lenses. These have more depth of field, and consequently are not as useful when using selective focus techniques.

In most cases, the rule of thumb 'focus on the most important part of the picture' will apply, but there are one or two instances where this will not give you enough guidance about what part of the subject to focus on. If, for example, you are shooting portraits at a wide aperture, depth of field is often so shallow that only part of the subject's face will be in focus. In this case always focus on your sitter's eyes, unless you have a particular reason for wanting the eyes out of focus. Sur-



Northern Picture Library

prisingly, a portrait in which only the eyes are in focus will often be acceptable, whereas one in which only the tip of the subject's nose is sharp will look ridiculous.

There are cases of portraits in which this rule could be broken successfully. One such case would be a picture of a potter or other craftsman. Here you might choose to focus on the hands, and let the whole face fall outside the depth of field of the lens. This would draw attention to the hands at the expense of the subject's face.

If you are photographing a landscape which seems to lack a focal point, you might consider focusing on an isolated tree or wall in the foreground, and using a wide aperture. This would confine attention to one part of the picture by the use of selective focusing. It would also

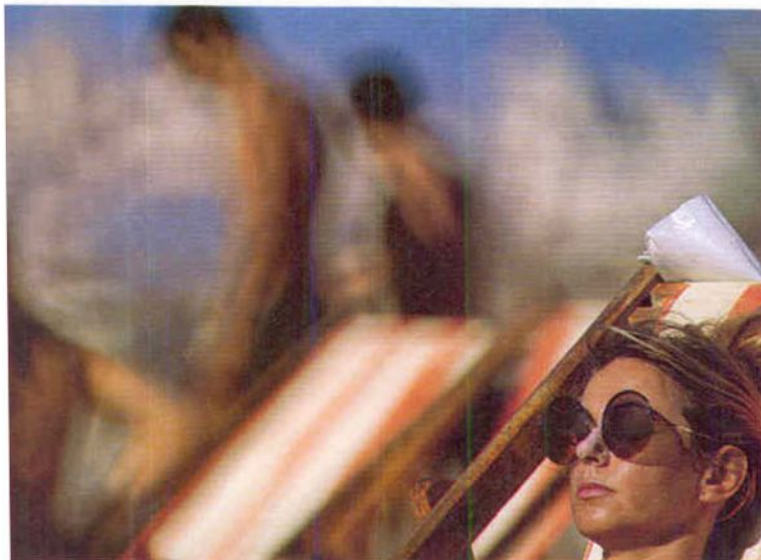
Centre of interest With no obvious subject matter, choose a feature which will most attract the attention in a scene

prevent the viewer's eye from wandering all over the picture, as it might if you were to adopt the more obvious solution of focusing on the scene behind.

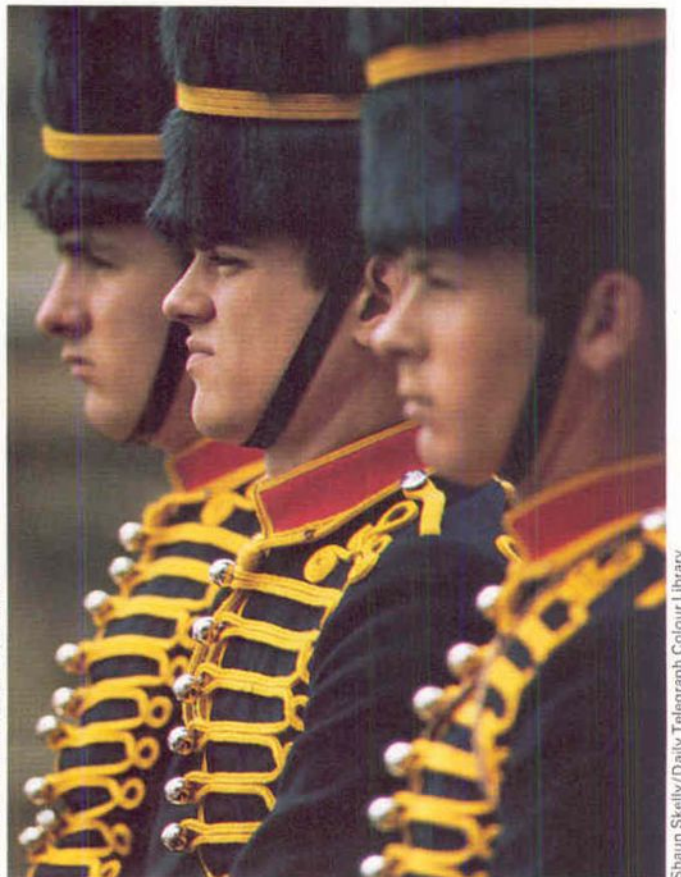
A background or foreground does not have to be in perfect focus in order to set the scene of a picture, and by isolating the main subject using selective focusing, the surroundings can give an impression of the setting without being so clear on the picture as to intrude. Images of cars and buildings in a city street do not have to be absolutely sharp in order to be recognizable, and will still add atmosphere to a picture in which the principal subject is isolated by selective focusing.

Similarly, photographs in a garden do

Groups of people When there are large numbers of people in a picture, it can often look cluttered. By focusing on one figure, the beach scene becomes a backdrop, and the soldier ceases to be so anonymous



Peter Keen/Daily Telegraph Colour Library



Shaun Skelly/Daily Telegraph Colour Library

not have to show every flower head sharply drawn in order to get across the idea of flower beds. Out of focus flowers will appear as blobs of bright colour which do not draw attention away from the gardener in the middle of them.

Comprehensive focusing

Once you know a little about depth of field, obtaining sharp focus throughout the picture seems an easy matter, but it depends as much on where in the picture you focus as it does on the aperture that you use. Ironically, when photographing a distant scene the best point on which to focus is not infinity.

If you are taking pictures at a medium aperture such as $f/8$, and you focus the lens on infinity, depth of field will extend from a point closer than infinity, around nine metres on a standard lens, to some point beyond infinity. Any depth of field that extends beyond infinity serves no useful purpose. Instead of wasting it it is possible to focus on a point closer than infinity. This brings the near point of sharp focus closer to the camera, while still keeping the far distance sharp. If the point of distant focus is at infinity, the lens is focused on what is called the *hyper-focal distance*. This is different for each aperture on a lens. Though it is never marked on the lens barrel, it is easy to locate—just align the infinity marking for the lens with the depth of field mark for the aperture in use, and the lens will be focused on the hyperfocal distance. For a scene that includes infinity, this will give maximum possible depth of field.

To get the maximum amount of depth of field in a picture that does not include infinity, do not simply focus on a point, because there is always more depth of field—usually about twice as much—on the far side of the point of sharpest focus than there is on the near side. Consequently, the best place to focus the lens is about one third of the way between the nearest point that has to be sharp, and the most distant point.

Wide angle lenses have much more depth of field than standard lenses. A 28 mm lens, for example, when stopped down to $f/22$, will give sharp focus from infinity to 0.6 m when focused on a point about 1.3 m from the camera. This extra depth of field can be useful in situations where it is difficult or impossible to focus, such as in a dark room when using flash.

Focusing problems

There are situations where it is impossible to focus through the lens. Sometimes the subject of the picture is reluctant to be photographed, or is camera-shy, and freezes when a camera is pointed at him. There are a number of ways of getting round the problem, besides using a wide angle lens at a small aperture. The most obvious solution is just to estimate the distance and set it on the focusing scale of the camera. If your estimates are not accurate, you could try focusing on another subject the same distance away then turn to your original subject and release the shutter.

SLR cameras are particularly difficult to focus when used in low-light conditions, or with wide angle lenses, and these are situations where rangefinder cameras excel. If you are using an SLR much of the light that enters the camera lens is absorbed by the viewing system—the mirror, prism and viewing screen. In bright light, this does not matter, but when the light gets dim it becomes in-

creasingly difficult to focus this kind of camera. If a wide angle lens is fitted, the point of sharpest focus is often hard to locate precisely, particularly if the lens does not have a wide maximum aperture.

Rangefinder cameras such as the Leica use a viewfinder that is separate from the taking lens, and are easier to use in low light situations, since very little light is lost in the viewing system.

How to focus



Reflex focusing 1 *Tiny prisms break up the out of focus image*



Rangefinder cameras 1 *Here, the central portion is displaced*

The simplest cameras have no way of focusing the lens. They rely on a small aperture to keep everything sharp, and are focused permanently on the hyperfocal distance of the lens.

Other slightly more complex cameras have a moving scale on the lens that is matched up with a dot or line in order to set the focused distance. These cameras have to be focused by guesswork. All others have some means of measuring distance, and can be divided into two groups, **single lens reflex**, or SLR, and **rangefinder cameras**.

SLRs

In an SLR, a system of a mirror and a prism projects on to a ground-glass screen an image identical to that which will fall on the film. So when the image on this screen (which is visible through the viewfinder window) is in focus, you can be sure that the image on the film will also be sharp.

Most SLRs have one or more focusing aids on the screen. The most common of these is the **split image rangefinder**. When the subject is out of focus, the line that runs through the middle of this central circle will break the image of the subject into two. By turning the focusing ring, the two halves of the subject can be united.

Around this central rangefinder spot, or instead of it, there is often a ring of **micro-**



2 *The broken up image becomes smooth when the subject is in focus*



2 *The secondary image merges with the main one when focus is right*

prisms. These will appear to shatter an out-of-focus subject into many tiny triangles. If the focusing ring is turned to bring the subject into focus, the triangles will seem to disappear.

As well as these aids, many cameras have an area of plain ground or matt glass. Although it is not easy to focus using plain matt glass if you are using a standard lens, there are some circumstances where the split image rangefinder and the micro-prisms become useless. These focusing aids are designed specifically for use with standard focal length lenses at wide apertures and if you are using lenses of longer focal lengths, or if the maximum aperture of the lens is small, they will often partially black out. In these cases, it is necessary to focus the lens using the ground glass portion of the screen.

Rangefinders

In the middle of the viewfinder of one of these cameras you will see a slightly coloured patch—usually a circle or a square. This patch shows a second image of the part of the subject at the centre of the picture, but it is displaced slightly to one side. By turning the focusing ring on the lens, the coloured image can be made to move sideways across the main picture until it coincides with it. When the two images meet, the lens is focused on the object shown in the coloured patch.

Deserted Pier

A grey day . . . a seaside pier . . . what could be more dismal? Yet with the right approach, the subject comes to life, with plenty of colourful shots to be found



In the off-season months there are great pictorial possibilities awaiting the keen photographer who is willing to go a little out of the way to explore a more unusual subject.

Much of the atmosphere of a seaside resort comes from its pier. These constructions are of particular interest since they are gradually disappearing—either because the towns cannot afford to maintain them properly or because of severe winter storms. It is always worth making a pictorial record of a pier—next year it may not be there!

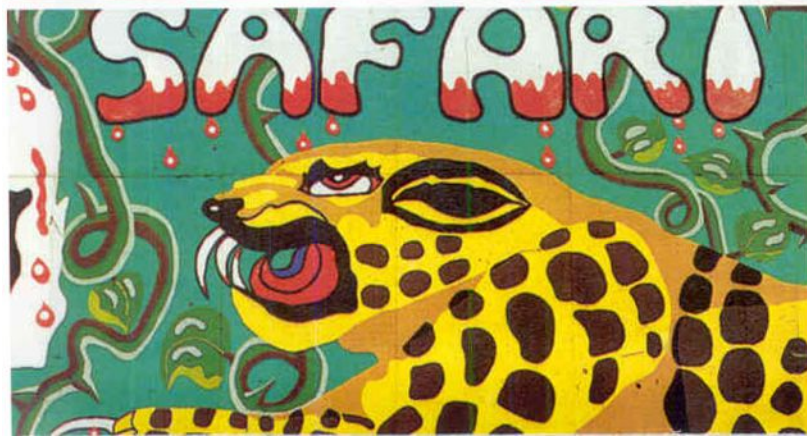
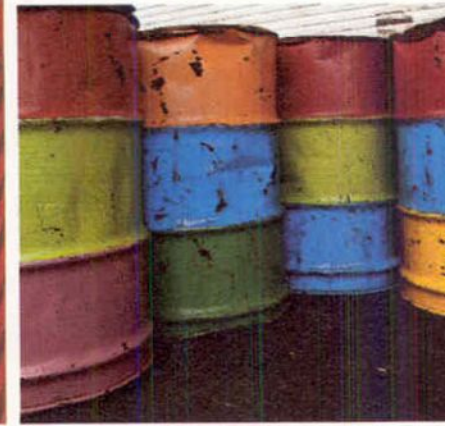
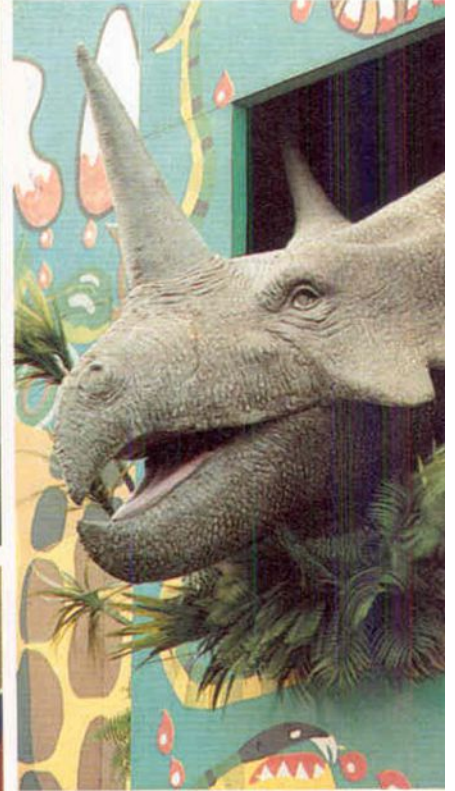
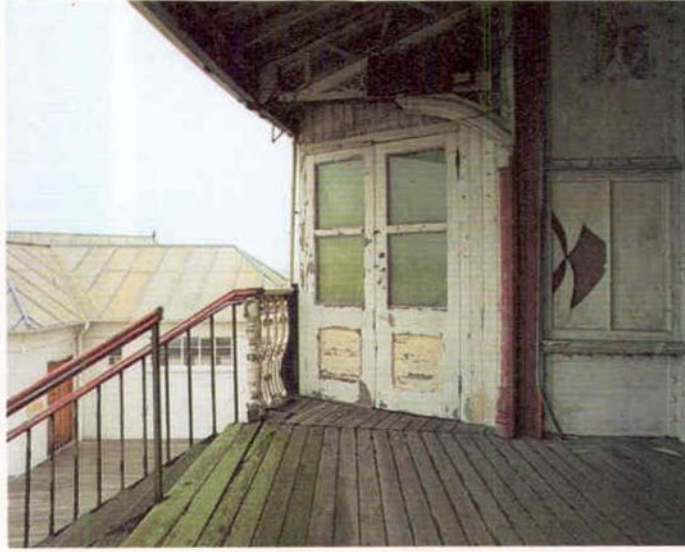
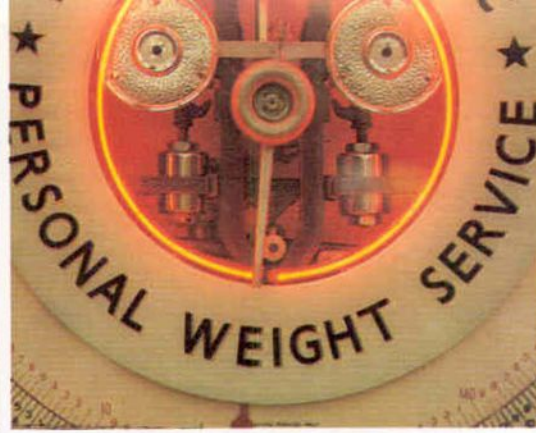
In summer a pier is a busy centre providing entertainment for both children and adults. Fishing decks, amusement arcades, aquariums, fairgrounds, boat excursions, bingo halls and concerts are just a few of the things which are open to visitors.

Out of season, much is stored away and the feeling of emptiness and desolation is strong. While the atmosphere is very different, there are striking subjects for the photographer to tackle. Instead of looking out for wide sweeping shots of holiday crowds, fairgrounds and expanses of blue sky, the main areas of interest are found in details and in contrasting them with the emptiness to be seen around them.

Clacton Pier is typically English, especially if you visit it on an overcast December day, but you can find wharves and jetties and other similar structures in

The entire pier Difficult to photograph effectively because of its size and overall lack of colour **Moving closer** Gianni found a small area more interesting







Selection Gianni's pictures show how an eye for detail, composition and colour is vital to make the best use of a location. An overcast day did not help matters, but by using filters to warm up the colours there was no overall cast and the brighter tones were clear. Careful framing was also very important

were no objects which looked interesting in the poor light and there were no striking colours either. A building at the end of the pier did catch my eye since it typified the deserted scene. The photographs I took of this building were helped by the converging planks on the floor which lead your eye to the main subject.

After these wide angle shots Gianni concentrated on photographing colourful details. Many of the pictures only covered parts of the whole objects.

'Making effective use of the strong colours and finding a striking composition does not mean that you have to let the viewers see the whole of what you are photographing. Sometimes it pays to be enigmatic and to keep them guessing.'

The shots Gianni took show that there are great opportunities at piers even if the weather is poor. The equipment used was largely irrelevant but what is needed is an eye for detail, composition and colour. An assignment like this can be an excellent way of bringing out these qualities—and out of season, you have plenty of time to study the possibilities without getting in other people's way!

many parts of the world. At first, Gianni Ferro found the conditions most unsatisfactory for taking good photographs. But after walking around in the windy and gloomy surroundings, a great many possibilities started to emerge. For some shots the greyness and the overall lack of colour could be used to underline the deserted feeling of the place, but to offset this Gianni had to look very closely to find interesting and colourful details.

'So much of photography is concerned with looking at things the right way,' he explained. 'At first it may seem that there are no photographic possibilities at all. But if you look very carefully, knowing that there must be something to photograph, things start to strike you. A colourful group of benches or a painted face suddenly provide a wealth of possibilities. Pretty soon you are noticing all kinds of things.'

Using Ektachrome 64 colour slide film, it was important to use 81A or 81B filters to warm up the colours. Without such filters, the dull light would have given the transparencies an overall blue colour. Since the film was relatively slow and it

was a very windy day, a tripod was used for nearly all the shots. Gianni's choice of lenses ranged from 20 mm to 200 mm, while for some of the details of the peeling paint, a macro lens was used.

Gianni started by photographing the whole pier to place the series in context. After doing this from a distance he moved on to the pier itself and tried some wide shots of the whole area.

'These shots just did not work. There



Dismantled A fairground machine with shape and colour

Improve your technique

Soft focus

Soft focus is a technique which can create excellent photographs when used carefully. The important thing is to use it in a controlled way so that you can be sure of getting the results which were intended

Sharp, crisp pictures are the sort of photographs most people want to produce. Manufacturers go to a lot of trouble to produce lenses that give the finest possible detail. The viewfinders on many modern cameras incorporate split prisms and other devices to aid precision focusing.

Yet sometimes the picture demands another approach, a different way of presenting the subject. This is where soft focus comes in. By gently diffusing some, or all, of the image a different mood or response is evoked in the mind of the viewer.

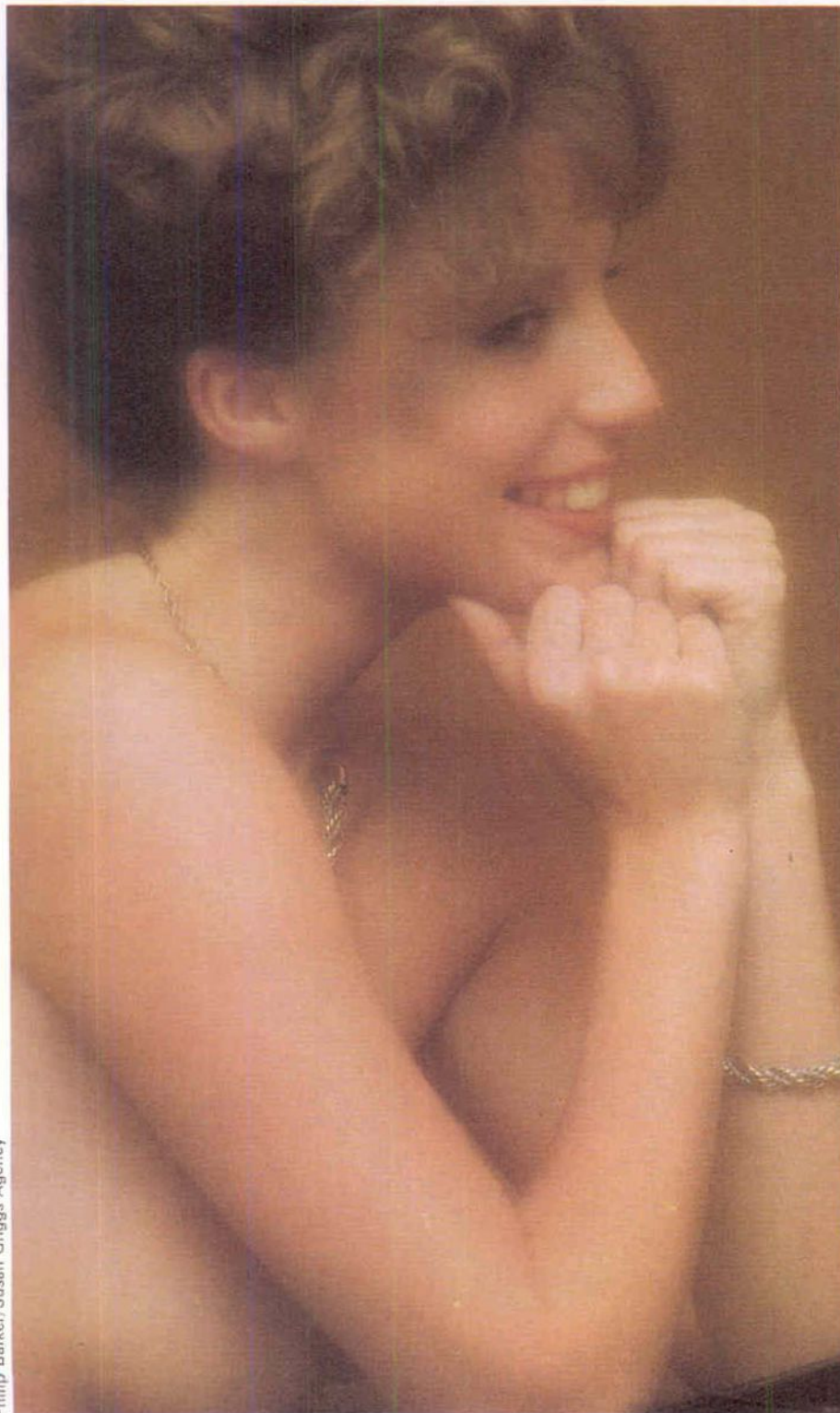
Unfortunately, as with all special techniques, there is a tendency for some photographers to overdo it or to use soft focus where it is completely inappropriate. This has given the technique a bad name with some people. They see it merely as a cosmetic treatment for otherwise weak pictures. Such an attitude ignores the fact that many fine pictures have been created in this way. The important thing is to use soft focus in a controlled way where it will create the effect you want.

When to use it

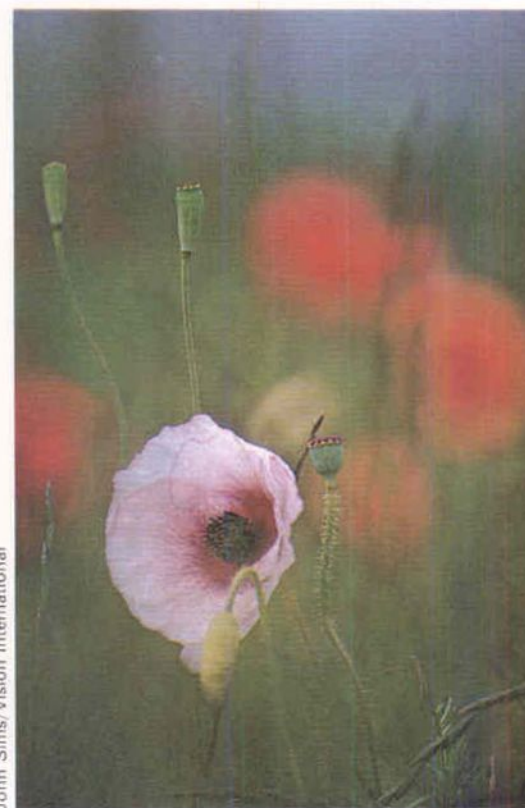
Soft focus originally came into use around the turn of the century when it was used to create photographs that imitated the paintings fashionable at the time. However, it did not take long

Overall diffusion *Strong soft focus obscures skin detail and creates an overall glowing effect*

Pseudo soft focus *A shallow depth of field has been used to mimic true soft focus in this flower shot*



Philip Barker/Susan Griggs Agency



John Sims/Vision International



Concentrating attention Leaving the centre clear focuses attention on important details

before it was realized that if it was used when photographing the fashionable women of the day, it would create a very glamorous effect. This is still one of its main uses today.

In fact, professional photographers tend to use soft focus whenever they want to make a subject particularly attractive and it is frequently used in fashion, glamour, advertising and food photography.

Most amateurs seem to use this approach for portraits, though there is plenty of scope for soft focus in other areas. The original use in landscapes is one of these. By obscuring fine details, the scene becomes more generalized so that it is composed of broad shapes. This can help if you wish to emphasize the beauty of the scene rather than record information about a place.

It can also be used when shooting the bright lights of a city at night. In this situation it further emphasizes the glow of the strong colours in the darkness.

Soft focus while shooting

There are a number of different ways of achieving soft focus in the camera. A translucent material, such as fine gauze, nylon stocking or glass smeared with a petroleum jelly such as Vaseline, can be placed between the lens and the subject. Alternatively a special filter or lens attachment, or even a special soft focus lens, is used on the camera when the picture is being shot. These devices scatter the light in the same way as mist or fog scatters the light from a street lamp. Not only do the fine details merge but the light diffuses outwards from the highlight areas creating a faint glow round them.

Such diffusion also reduces the contrast range of the image compared to the original scene. It is therefore sensible to select subjects that feature strongly contrasting areas. Diffusing subjects that lack contrast will create images that merely look flat.



Clear detail A good example of how too much detail can destroy the mood of a shot. The background also distracts the eye from the centre of interest, which is the shell rather than the sea



Atmosphere By using soft focus irrelevant detail is obscured and a sense of mystery is created. It also emphasizes the basic shapes

Simple soft focus

To begin with, the easiest way to create a soft focus effect, without going to any great expense, is to smear Vaseline on to a piece of thin glass or on to a spare UV filter.

There are two rules to observe when using Vaseline. Most importantly, never smear it directly on to the lens. Even if you manage to remove it the lens coating may well be irreparably damaged. Secondly, always use a very fine film of Vaseline. If you are using a 35 mm camera, either a print or a projected slide involves a considerable degree of magnification. Thus any effect created in the camera can end up looking rather crude unless care is exercised during shooting.

When spreading the Vaseline, remember that the direction in which you move your finger, whether in a circular fashion or in a series of straight lines radiating out from the centre, will affect the final result. Even the finest marks will create patterns in the diffused areas. Thus random movements of the hand should be avoided for this will create a chaotic set of diffusion lines.

How much diffusion

At some point you will need to decide whether you wish to diffuse the entire image, smearing all the glass, or only part of it, leaving a hole in the middle. Overall diffusion will appear soft and dreamlike but a clear centre will allow a contrast between sharp and diffused details to be created. By aligning the clear area with an important part of the image you can direct attention to it in a quite striking way.

The size of the clear patch is best determined in relation to the subject by trial and error. With SLR cameras the most effective balance between diffused and clear areas can be determined visually. If you do not have this facility you will have to make some trial exposures and judge the effect in the finished results. When doing this, begin by covering the edge of the image and gradually work inwards with each test until only a small spot is left.

The diffuser-to-lens distance

If you smear Vaseline on to an old or spare UV filter you will be able to screw it into the front of the lens easily. This overcomes the inconvenience of holding the diffuser during exposure. Such attachments cannot be moved away from the lens to vary the diffusion effect because the rim of the filter, being the same diameter as the lens, will soon obscure the corners of the image and cause vignetting.

If you coat the Vaseline on to a larger piece of glass it can be moved from the lens to vary the effect. However, care must be taken to avoid picking up reflections on the rear surface of the glass that will interfere with the image. A tube made of rolled black paper between the diffuser and the camera lens will prevent such reflections.

Special effects

Occasionally you will find a subject with which you can use the smearing of the Vaseline in a quite deliberate way to create a particular effect. By using a thicker layer of Vaseline and applying it in one direction the effect of rain or even shafts of sunlight can be created.

Other diffusing materials

As already indicated, fabrics, such as fine gauze or nylon stocking, can be used to diffuse the image. Always use white or pale tints as these will scatter the light. Dark materials will merely absorb it.

Materials, particularly nylon, can easily be stretched over the front of the lens and held in place by their own elasticity. However, this can easily obscure the focusing and aperture rings. It is more convenient to fix them to a filter holder, such as that used by the Cokin and similar systems.

When using nylon the degree of diffusion can be changed by stretching the material to a greater or lesser extent. It is also a simple matter to create clear areas by making holes in the nylon material.

Aperture and exposure

Changing the size of the aperture has an effect on the amount of diffusion that occurs. Not only does the diffusing material scatter the light rays that create the image, but it also picks up stray cross light from beyond the edge of the image area and deflects it into the



Gianni Ferro

camera. Obviously such deflections are going to occur more frequently round the edge of the lens. Thus, when the aperture is stopped down and the light is only passing through the centre of the lens, there is less opportunity for these deflections to occur.

In addition, only those rays passing through the centre of the lens will form the image when a small aperture is used. Those that have been more widely scattered will be stopped by the leaves of the aperture diaphragm. So if you wish to have the maximum amount of diffusion, you should work with the aperture open to its full extent.

Generally speaking, if you use the improvised soft focus techniques as

Colour shapes By diffusing the details of the foliage, attention is concentrated on the shape of the colour areas

described, you should not need to alter your exposure. However, those with cameras incorporating through the lens metering systems or automatic exposure control may experience minor exposure problems. As already indicated, the diffusing material deflects light into the lens from outside the image area, thus misleading the meter into giving a false reading. So, if you do experience slight underexposure when using soft focus, increase the amount of light reaching the film by up to one stop.

Soft focus filters and attachments

Inexpensive soft focus filters, that can be screwed on the front of the lens or attached by means of a separate holder, are now available in a variety of types that give a number of slightly different effects. Their main advantage is that the effect is consistent from one occasion to another. They are also quicker and more convenient to use than the improvised methods. The disadvantage is that you cannot create the subtle variations possible with fabric or Vaseline. However,

Shape A Cokin fog filter obscures fine detail and also emphasizes the shape of the tree

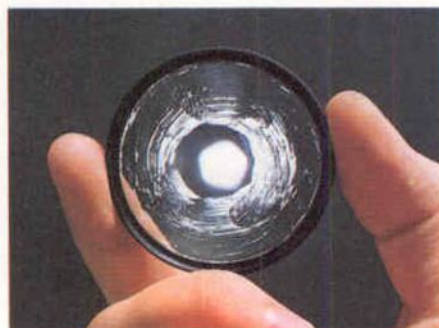
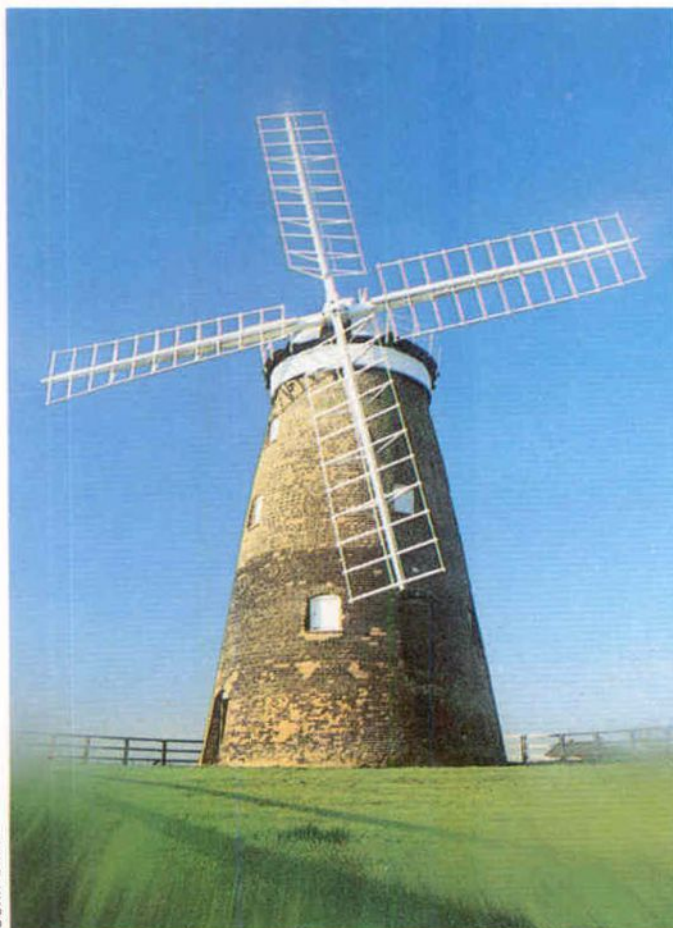
Backgrounds Here a black stocking diffuses highlight areas beyond the lorry to cut out distracting detail



John Sims



John Sims



Windmill By making clear emphatic marks in the Vaseline an otherwise dull area is given interest

Cottage A thinly smeared centre and a thick outer area create flare that enhances the 'olde worlde' effect

Blurred building Really strong streaking reduces the subject to a series of indistinct shapes

some systems allow you to combine filters and so vary the degree of softness in the image.

These filters are either Perspex or glass with a very lightly grained surface that creates the diffusion. Some have clear centre spots that allow the contrast effects between sharp and soft areas already discussed. Their effect on exposure is the same as that for improvised filters. Again the size of the aperture affects the degree of diffusion.

Much more expensive soft focus attachments are available that fit on to the front of the lens. The best known is the Zeiss Softar series designed for Hasselblad cameras. A set of three is available that give an increasing amount of diffusion as you pass from numbers 1 to 3. However, no variation is possible as

with the cheaper systems and the cost is such that their purchase can only really be justified by the professional user.

Soft focus lenses

In the past, when these effects were much in demand by professional portrait photographers, a number of manufacturers made this type of lens. They still turn up fairly frequently on the secondhand market. However, most were designed for use with studio cameras. Of the large manufacturers, both Fuji and Minolta still make these lenses for 35mm cameras.

Most soft focus lenses work by combining uncorrected lens distortions with a specially designed aperture plate that exaggerates the softening effect. The more you stop down, the smaller the

amount of diffusion created.

The Minolta Vari-Soft works in a different way. The relative positions of the glass elements inside the lens are changed by means of a ring. The disadvantage of all these lenses is their expense, which may be considered to be out of proportion to any advantages that they might have over the cheaper filters.

No matter which method you decide to use, the soft focus technique can produce very pleasing effects. But do not be tempted to use it too often otherwise it will lose its impact and you will find that your photographs lack variety.

Combining filters In this shot soft focus creates an overall magenta glow and an added starburst filter draws the eye to the highlight on the sunglasses



Electronic flash

As a compact and portable source of light for photography, an electronic flashgun is unrivalled. There is a vast range to choose from, so before buying it is a good idea to decide what features you really need

In situations where there is little or no light available, the flashgun is an invaluable addition to your range of equipment. With fast films and long exposures you may just be able to get your shot, providing that the subject is perfectly still. And you may get better control with elaborate photographic lights. But for impromptu shots, the sheer simplicity, portability and low cost of the flashgun is unbeatable.

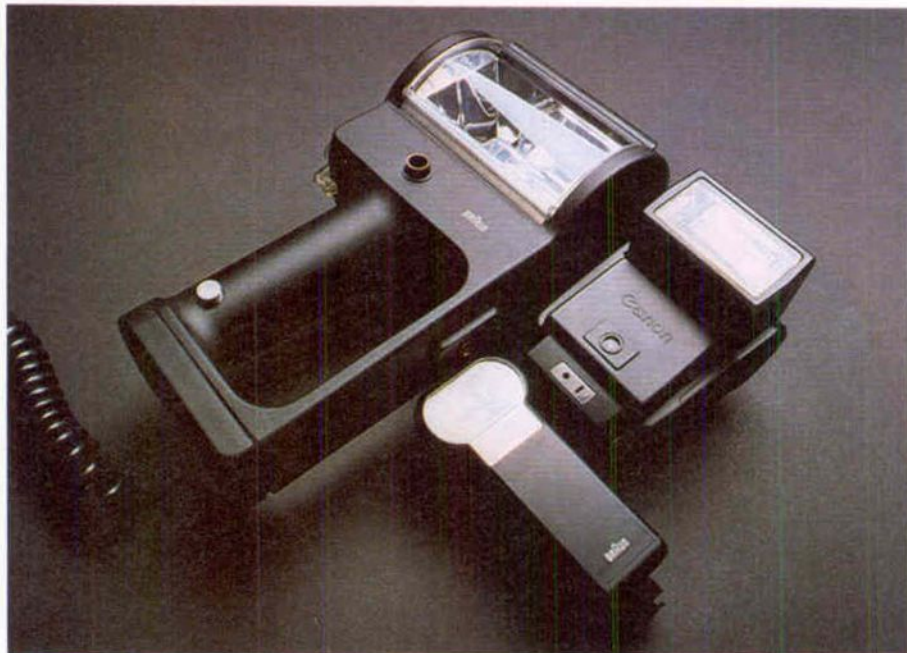
Although with some cameras, such as the cheaper 110s, the only form of flash on the market is the standard flashcube—just a more convenient modern version of the traditional magnesium flash bulb—there is now a tremendous range of electronic flashguns available for use with 35 mm and large format cameras. Flash bulbs can only be used once and then have to be thrown away, but you can fire an electronic unit again and again, many thousands of times. Though electronic guns are a great deal more expensive than a single flash bulb ever was, they are much more convenient and probably work out cheaper in the long run. Modern flashguns are also very reliable compared with the old bulb types.

Manual or automatic?

Although there are many individual types of electronic flash, they fall into two distinct categories: the manual type and the computer or automatic types. In the past, manual flashguns were far cheaper, but over the past few years the price of the automatic type has been brought down considerably and the difference in cost between the two types is now virtually negligible.

With manual units the intensity and duration of the flash is fixed and cannot be changed to compensate for the reduced amount of light reaching distant subjects. So with the flash attached to the camera, the photographer must compensate manually by adjusting the exposure according to the distance of the subject from the camera. Because the flash always has the same duration, changing the shutter speed will not significantly affect the amount of light falling on the film and exposure adjustments can only be made by altering the lens aperture.

However, the shutter speed does affect the use of flash: you can only use shutter speeds slower than a certain value (see page 85). If these speeds are exceeded, the flash will fire when the shutter is not fully open. The fastest synchronization speed is generally 1/60 or 1/125 sec.



Flashgun choice The large gun at the back would be ideal for a press photographer, but for family snaps, the two small units at the front would be more suitable

Synchronization is usually achieved by making an electrical connection between the camera and the flashgun. Most guns are designed to fit into the *flash shoe* on the camera, usually above the viewfinder. Contacts in the shoe align with contacts in the flash unit, to operate the flashgun when the shutter release is pressed—the *hot shoe* arrangement. The alternative is to have a separate cable that runs from the flashgun, and is plugged into the camera.

The correct aperture is usually found by consulting a table printed on the back of the flashgun. Though this takes a little time, it is a very simple operation. You either measure or guess the distance of your subject and then read off the aperture in the column appropriate to the speed of the film in your camera.

If you feel such calculations would interfere with your shooting, you may prefer an automatic flashgun. With an auto unit, the aperture is simply set according to the film speed, and provided the subject is not too far from the camera the flashgun does the rest. The intensity of light reflected from the subject is measured by a photocell, set in the front of the flashgun, and the duration of the flash is automatically varied accordingly. If you intend to take pictures of very distant subjects, or out of doors, it is a good idea to check the

upper limit of the auto range on the flashgun you plan to buy.

An additional advantage of this system is that it takes into account the brightness of the subject as well as the distance. Understandably, automatic flashguns are now the most popular.

To generate the bright light a flash must give requires a considerable amount of energy and the flashgun's energy system must play an important

Auto and manual The unit on the left is an automatic 'computer' flash, and would cover most people's requirements. While the manual gun on the right is suitable for straightforward uses, it does not have as much power or versatility



part in your final choice of gun. If you buy an automatic gun, for instance, you will have to choose between the basic units and the more expensive *thyristor* type. With the basic units, some shots will use less energy than others but the gun will still consume the same amount of power and the excess energy is simply wasted. With the power saving or thyristor type, the unused energy is retained for the next flash.

Although thyristor guns initially cost more than the conventional automatic units, they greatly extend the life of the batteries by using the minimum energy, and may be cheaper in the long term. More importantly, thyristor guns give a substantially shorter recycling time. This means that after each flash, they are ready to fire again very rapidly.

In most cases the energy is provided by a battery, although a few of the more expensive units have a mains adapter facility. Some flashguns accept only one type of battery or require a lot more power than others. It is worth looking at all the available options and deciding

Bounced flash The photographer bounced the light of his flashgun off the ceiling of the room to get the natural looking lighting for this picture. Direct flash (right) gives harsh lighting, and forms a dark shadow to one side of the subject. By bouncing the light, (far right), the hard shadow goes and the light becomes softer. Automatic flashguns with tilt heads make bounce flash simpler



Red Saunders



Jon Bouchier



Photomakers (Philips Lighting)

which suits your needs best.

There are two kinds of battery used in flashguns: rechargeable and non-rechargeable cells. Of the non-rechargeable batteries, conventional dry cells like those used in torches are by far the cheapest form of battery. Dry cell batteries are probably the most economical source of power, even though they have a relatively short life. Unfortunately, this type of battery tends to leak and if you use your flashgun rarely, it is worth removing them during long periods of storage.

If you take flash pictures regularly, but

still not frequently, you will probably appreciate the virtues of the manganese alkaline cell. Non-rechargeable batteries of this type are made by most manufacturers, but perhaps the most familiar are the Mallory Duracells. Manganese alkaline cells are more expensive than ordinary dry cells but have a longer life. Fortunately both the main types of non-rechargeable battery are almost always interchangeable and you need not decide between the two when you select your flashgun.

If, however, you intend to take large numbers of flash photographs, it may be

Jon Bouchier



Paul Williams

Battery power The more costly guns offer several alternative power sources

Professional flash Although this gun has high power and many features, it sacrifices portability and compactness

worth considering buying a flash unit that will accept rechargeable batteries. Many professional portable units will only accept rechargeable batteries.

Rechargeable batteries

There are two kinds of rechargeable battery available: the *lead-acid* type, which is a smaller version of the car battery, and the *nickel-cadmium* cell.

Lead-acid batteries are heavy and bulky, and must be carried in a pack over the shoulder, separate from the gun. This may seem terribly inconvenient, but it is an arrangement preferred

by press photographers because lead-acid cells are the most powerful of all batteries, giving far more flashes per charge, and halving recycling times.

For the non-professional user, though, the nickel-cadmium type is less bulky and is a much more practical option. Nickel-cadmium cells are often made to fit exactly into the place of ordinary non-rechargeable cells, or they may be quite different in size. Some flashguns can accept a cluster of small dry or manganese cells or a single large nickel-cadmium battery.

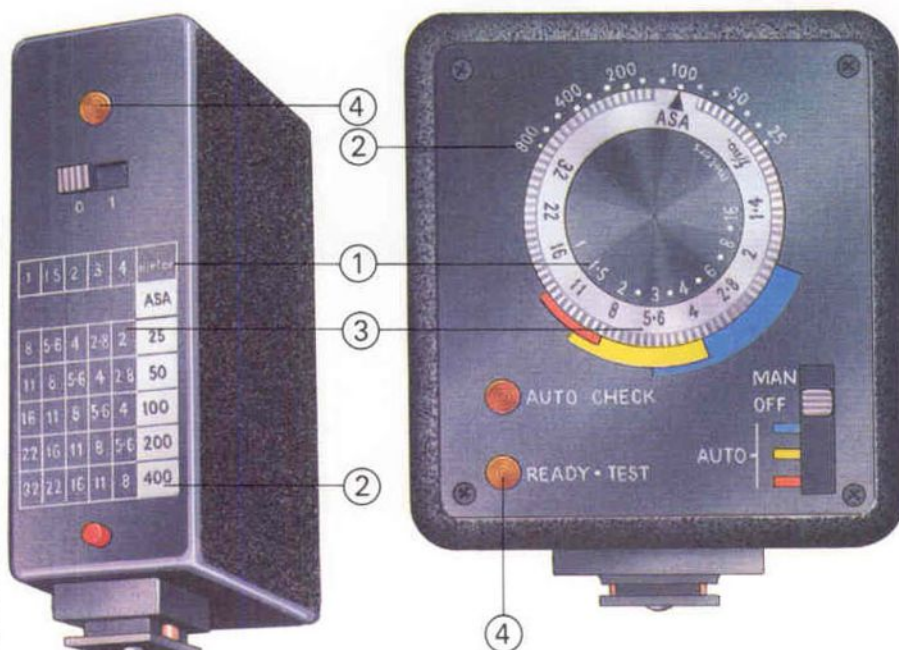
Whatever the shape, the principle of

a rechargeable battery is the same. When the battery runs down (this can be judged by when the recycling time rises to 30 seconds or a minute) a special charger is plugged into the gun, or the cells are removed and inserted into the charger. The charger is connected to the mains supply, and after several hours, usually between 3 and 14, the batteries will be up to full power.

Since the cost of rechargeable cells and a compact charger is so high, it is perhaps a good idea to buy a flashgun that accepts both rechargeable and non-rechargeable types. Then if you find

Exposure calculation All flashguns have some sort of chart or dial on the back or side, to help the user work out the correct aperture. On a manual gun, such as the one at far left, the photographer looks along the line adjacent to the film speed that is being used (2). The distance from the flash to the subject is read from the scale at the top (1), and where the two rows meet, the appropriate aperture can be found on the aperture scale (3). Automatic guns are easier to use. This typical gun allows the user to choose one of three apertures. The choice is indicated by the right-hand end of each of the three coloured bars. For the film speed that is in use (set on scale 2), the photographer can choose $f/2$, $f/4$, or $f/8$. The switch at bottom right enters the chosen aperture into the flashgun's 'computer'. Automatic guns can be used only over a limited range (indicated on distance scale 1). Both guns have a ready light that comes on when the unit is ready to be used

Paul Williams



yourself taking so many flash pictures that you get through non-rechargeable batteries at an unacceptably high rate, you can simply purchase a nickel-cadmium cell and a charger rather than a new flashgun. It will cost you less in the long run.

Flash power

Another important consideration is the power or brightness of the flashgun. A distant subject needs a more powerful flash to illuminate it properly than a nearby subject. So if you are often likely to photograph distant subjects by flash, you will probably need a more powerful unit than if all your flash pictures are going to be close-ups.

A figure that simply told you the power of a flashgun would be of little value—you need to know how it will affect exposure. This is what *guide numbers* (GNs) do. Guide numbers indicate the amount of exposure needed with a specific film speed for a certain distance. Usually, the GN for a particular flashgun is given for 100 ASA (ISO) film, but for other film speeds a simple table is provided, from which you can read off the correct aperture alongside the distance from the camera to the subject. The illustration opposite explains this.

The higher the GN, the more powerful the flash unit and the greater the distance over which it is effective. Unfortunately, more powerful flashguns tend to cost much more and you must balance your requirements with your pocket. A typical low-cost unit will have a GN of 18 (metres/100 ISO), while larger guns have guide numbers of 45 or more.

Some units offer a choice of guide numbers, which allows for photography under a range of conditions. There is certainly no point in buying a more powerful unit just for the sake of it—a powerful gun can sometimes be positively awkward to use, particularly if you take a lot of close-ups by flash.



Jon Bouchier

Tilt heads This triple exposure shows the way that the heads of some guns tilt up to bounce light from the ceiling



Weegee/Side Gallery

Flash for impact American master photographer Weegee used direct flash for this picture of two theatre critics on the steps of the New York opera house

Tilt and swivel heads

A flash pointed straight at the subject from the top of the camera often produces horribly flat, washed-out results. The solution to this problem is to 'bounce' the flash off a ceiling or wall so that it is much more diffused, giving a softer effect than direct flash. This means that the gun must be tilted towards the reflecting surface.

One way of doing this is to remove the flash gun from the camera and, holding it in one hand, or on a *flash bracket*, point it at the ceiling. Unfortunately, with an auto flashgun, this upsets the exposure because the photocell measures the light reflected from the ceiling rather than the light reflected from the subject. So the photographer has to set the exposure manually after some complex mental calculations.

Units with tilting heads go some way towards solving this problem. With this type of gun, the flash head can be tilted to point up at the ceiling while the photocell remains directed at the subject. Because the photocell sees exactly the same reflected light as the camera, the automatic flash control still works.

With some of the more expensive flash units, the photocell can be removed from the gun. This means that you can leave the photocell directed at the subject while taking the flashgun off the camera and pointing it in any direction. The photocell is usually mounted on the camera hot shoe and the flashgun is secured to a bracket on the side of the camera. This feature is more versatile than a tilt head because you can bounce

the flash off a wall or the ceiling, whenever appropriate.

A more convenient solution, though, is a flash head that both tilts and swivels sideways. These are more expensive, but may justify the outlay if you do a lot of flash photography. If you regularly use bounce flash, though, it is worth getting a more powerful unit, because the amount of light falling on the subject is greatly reduced, and you may find yourself working at a very wide aperture.

Dedicated units

Most camera manufacturers now offer guns designed specifically for their own cameras, referred to as *dedicated units*. The idea behind these is to make life easier for the photographer by automatically setting the correct synchronized shutter speed and by incorporating the flash ready signal in the viewfinder so that there is no need to look at the back of the gun. Unfortunately, such units cannot be transferred between cameras of different makes. This means that if ever you change your camera, you will have to change your flashgun too.

Whatever gun you select must suit your needs. So before you commit yourself, work out just how you will use the flashgun and avoid buying redundant features. In particular, you should think about the sort of power you are likely to need: a whole range of sophisticated features will not make up for a basic lack of power, while a flashgun that illuminates your sitting room like the floodlights at the international sports arena will be equally awkward to use.

Rock group

All pop groups, from supergroups to the local hopefuls, need publicity shots—providing an assignment with unique problems. Finding a new approach calls for imagination, skill and tact



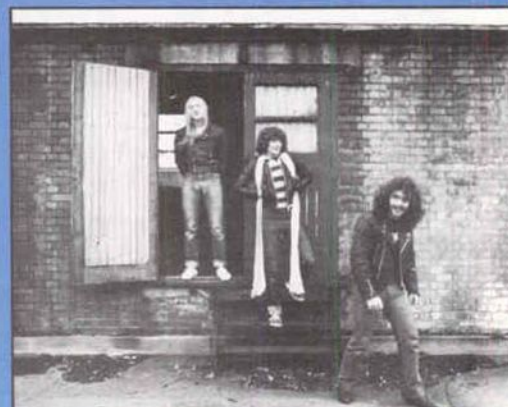
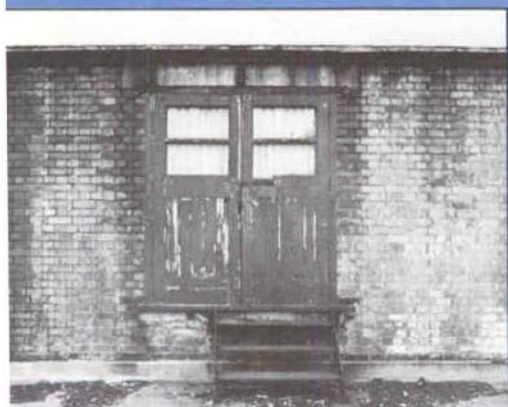
Quite a large amount of organization was needed before the session could take place. The group was in the middle of a busy touring schedule and so Janette had to try and fit the session into one of their few free mornings. With a time arranged, it was also important to make transportation plans to ensure that the musicians arrived on time. Not only are rock musicians not the best time keepers, but these were also unfamiliar with the area. Finally, a suitable location had to be found and arrangements were made to use a dockside warehouse.

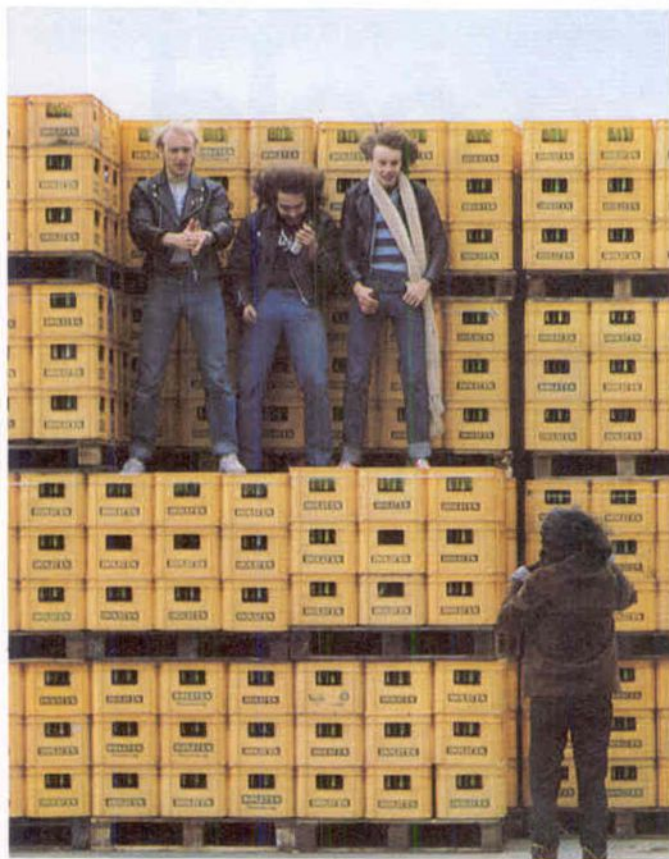
When the session actually took place,



Janette Beckman has built up a strong reputation as a photographer of rock musicians and so she had no worries when asked to do a series of shots of the group 'Vadis'. The idea was to produce a variety of photographs suitable for promotional use and to try and get one shot which would be effective for a record cover. For this reason, both black and white and colour film was used.

Framing inside a window and using the surroundings helped to produce an interesting shot Fork lift truck driver took an interest in the session and Janette saw the opportunity for an unusual photograph **A sequence of the group emerging through a doorway was also a good way of adding humour and variety to Janette's series of photographs**





the group were a little shy of the camera and it took a while before they were relaxed enough to be photographed in a more natural way. Janette made things as easy as possible for them: 'Once you are used to photographing people it becomes a lot easier to make them feel at ease in front of the camera,' she explained. 'For this sort of work your technique and equipment are less important than the way in which you relate to your subject and the relation-

ship which you are able to establish with people you have never met before.'

Making best use of the location, Janette photographed the group in a variety of poses using different backgrounds all the time. The group became increasingly cooperative and seemed to feel more at ease when they were kept moving around the building. Janette even photographed sequences of them coming out of a doorway to add some variety.

A range of equipment was used during

At work *When she is on assignment, Janette prefers to use a minimum of equipment and make the best use of the surrounding area*

On the roof *Once they were fully relaxed the group were having fun*



the session. Some shots were done on a roll film SLR with an 80 mm lens while others were done with a 35 mm SLR and a 35 mm lens. Janette rarely uses other lenses and likes to keep her equipment down to a minimum. To her, it is far more important to find good surroundings and to make the subject feel at ease, as the more relaxed the subjects are the better the photographs are likely to be.

'Often you find that the shots you did at the beginning of the day aren't nearly as good as the ones done towards the end of the session when everyone is completely relaxed.'

One of the last shots of the session did actually turn out to be the best and is the sort of photograph which is used on record covers or for general promotional purposes.

Silhouettes *This turned out to be the best one of the session and could be used on one of the group's record covers*





Creative approach

Out in the cold

If the first sign of winter gloom sends your camera into hibernation, remember that while there is light you can take pictures, and winter is as full of photogenic opportunities as any other time of year

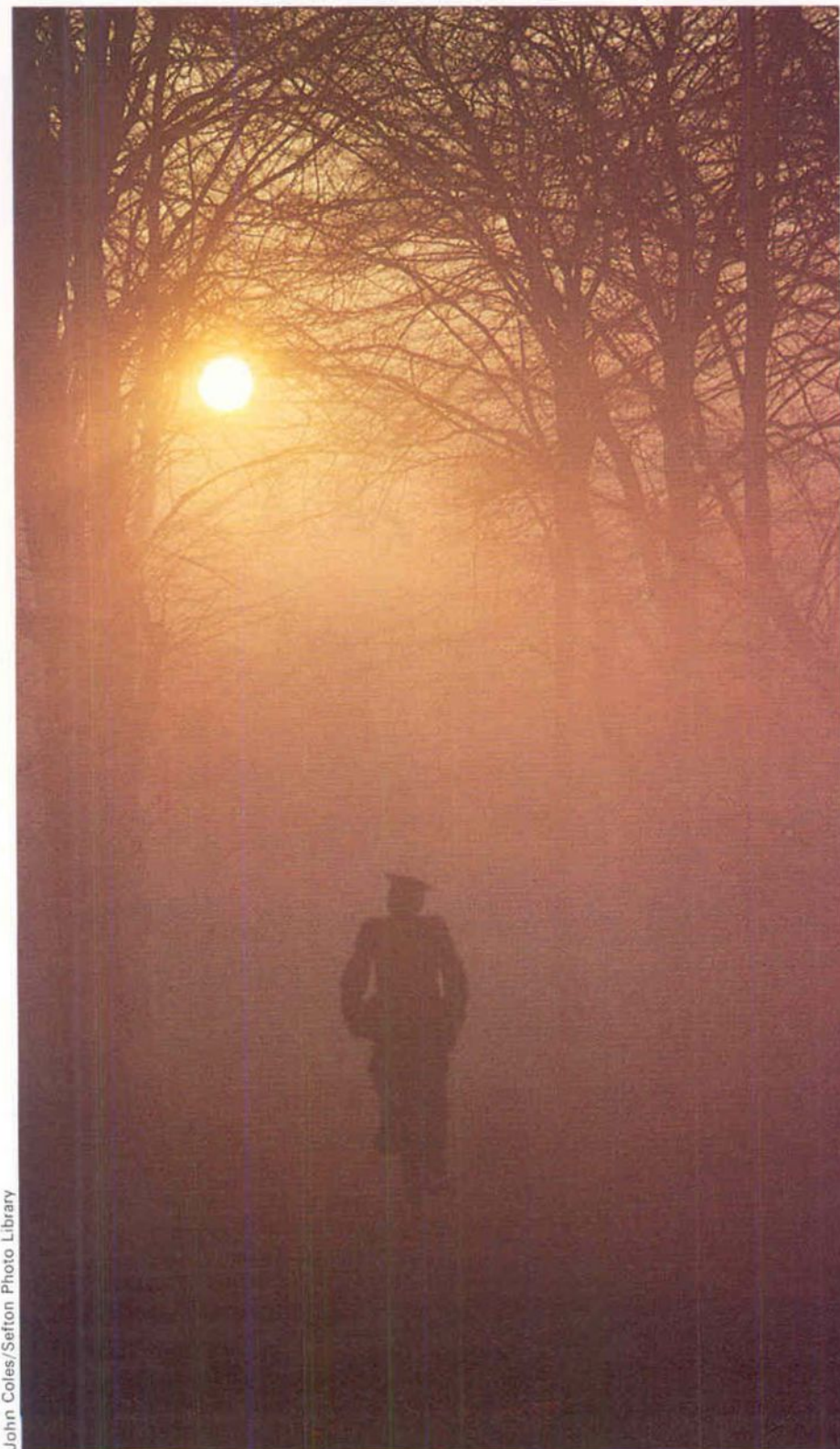
Winter is a time when many amateur photographers leave their cameras at home on all but the brightest of days. But despite the gloom, this season can provide a wealth of pictorial possibilities. With fewer people venturing outdoors with their cameras in winter, you have a better chance of getting some unusual shots if you are willing to go out in the cold yourself to test your skills and imagination.

Winter conditions can often create an atmosphere by themselves and you will find that scenes which look very ordinary in the summer can take on a new dimension in the winter light. Ice, fog, rain, snow, bare trees and dramatic skies all contribute towards the unique qualities of winter—qualities which you can capture on film.

There is no such thing as 'typical winter weather'. Even in a small island

Morning delivery *In winter mists, the world is simplified into isolated shadows. Lone figures can make poignant and atmospheric pictures*

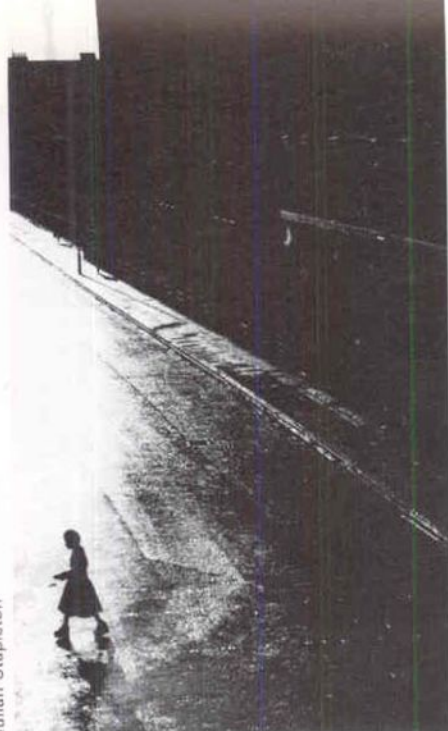
On patrol *Shrouded by the gloom and a heavy coat, it can be much easier to take candid shots like this in winter—if you are prepared to brave the weather!*



John Coles/Sefton Photo Library



Jerry Young



like Britain there is a tremendous variety of winter conditions. While snow is a regular occurrence in Scotland and the north of England, it is seen less in the south. Far more often, wherever you live, winter consists of damp overcast days. Mist can also be a regular feature, but even so, many winter days are bright and clear and convey none of the gloom often associated with the season. Each weather condition calls for its own special approach when you are out taking pictures.

Winter photography need not be restricted to landscape and natural scenes. Winter makes its mark on the faces and activities of people and this effect alone can be a challenge to the

Black and white
In the gloom of winter, colours are subdued, giving the opportunity for moody pictures

Tower in the snow
Bare trees are starkly silhouetted in a snowy scene

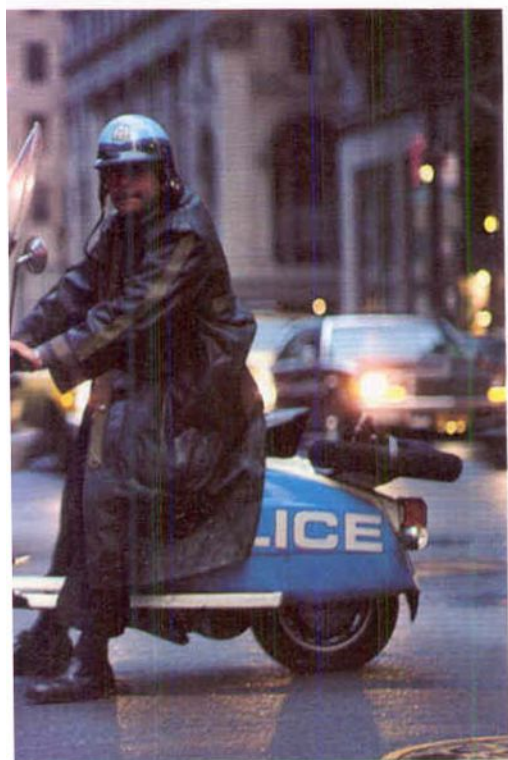
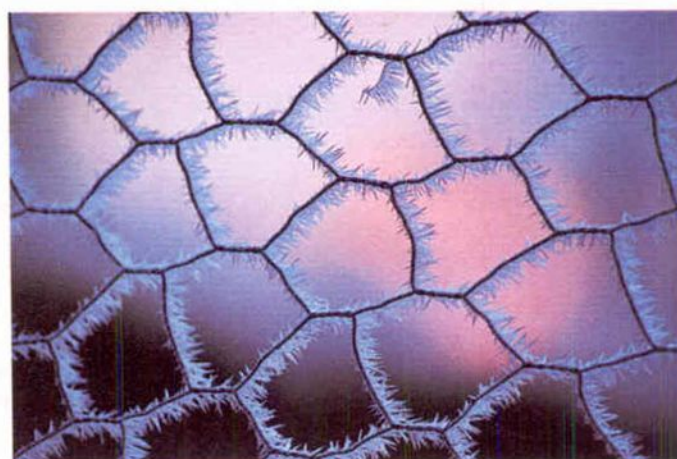
Frosty mesh
Get up early to catch the beautiful patterns of heavy frost in the morning sunshine

photographer. Striking effects may be produced by the grim expressions on the faces of the pedestrians while heavy clothing, rainswept pavements and erect umbrellas can all contribute towards a moody scene well worth photographing.

Equipment and technique

Although most of the basic principles of good picture taking hold true throughout the year, there are several aspects which are particularly important in the winter months. Both photographer and equipment should be well protected from the elements.

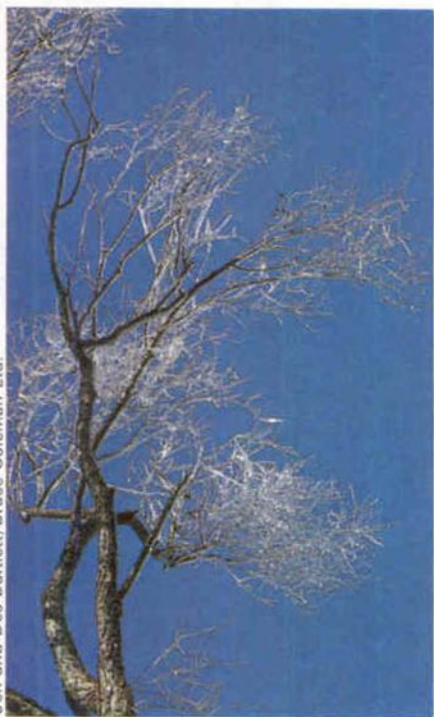
Wet or damp conditions can be particularly harmful to photographic equipment. To avoid exposing expensive gear to the elements, use a good case or bag and make sure that it is waterproof. A strong transparent cover can be useful for protecting your camera and lens barrel when you are taking pictures in the rain. Cut a hole through which the front of the lens can protrude. The lens should have a clear or 'skylight' filter which will protect the lens surface from rain and snow—a useful precaution at all times. You may also find it useful to wear a bulky waterproof coat or anorak



which can protect both you and your equipment. Photography on short, dull winter days will obviously call for fast film, but remember that this tends to give low contrast grainy results. Some subjects will suffer from this, particularly on misty days, when a slower, higher contrast film will yield much better pictures. If your films tend to stay in the camera for some time, rather than being used up in a single session, it is probably best to opt for a fast film. But low and medium speed films have their uses, particularly if you have a tripod and are photographing motionless subjects. Even slow colour films can produce excellent results, bringing out what colour there is better than faster films.

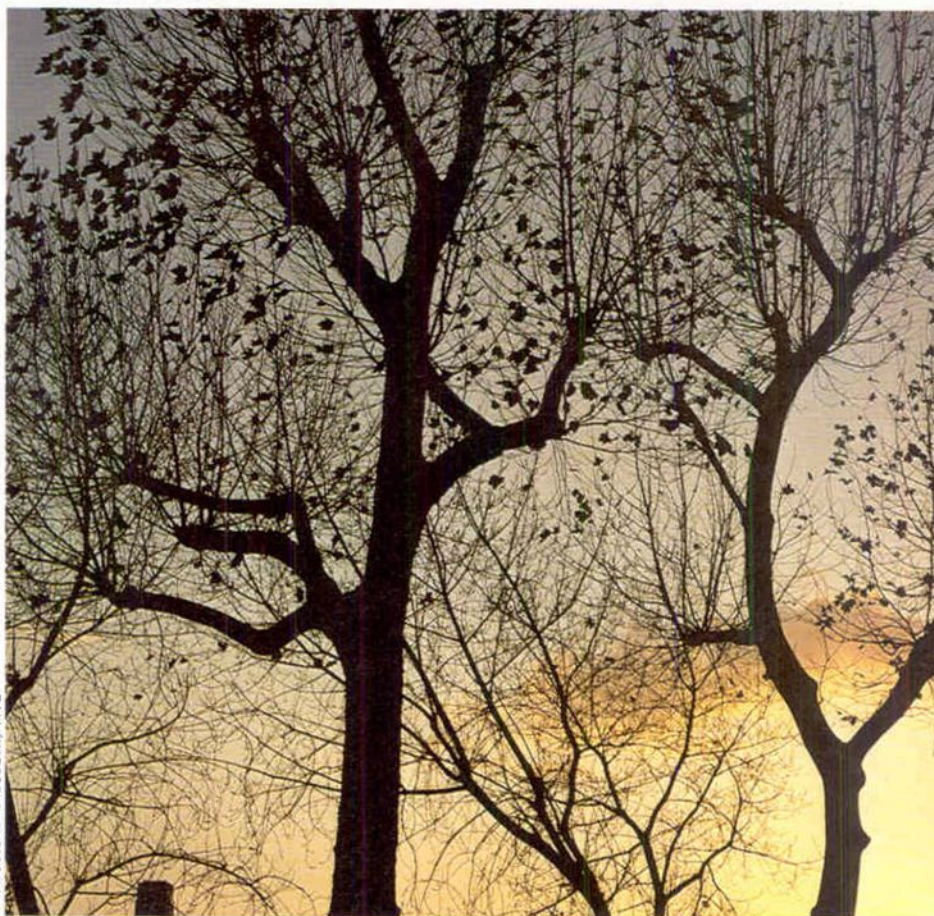
Another consideration is the light itself and the effect which it will have on the film you are using. If you are shooting on a dull, overcast day and your camera is loaded with a colour transparency film, the results will be disappointing unless you use a colour correction filter. Without a filter the transparency will have a blue cast and will generally lack brilliance. This can be avoided if you use an 81A or 81B filter. These warm up the tones and reduce the

Jen and Des Bartlett/Bruce Coleman Ltd.

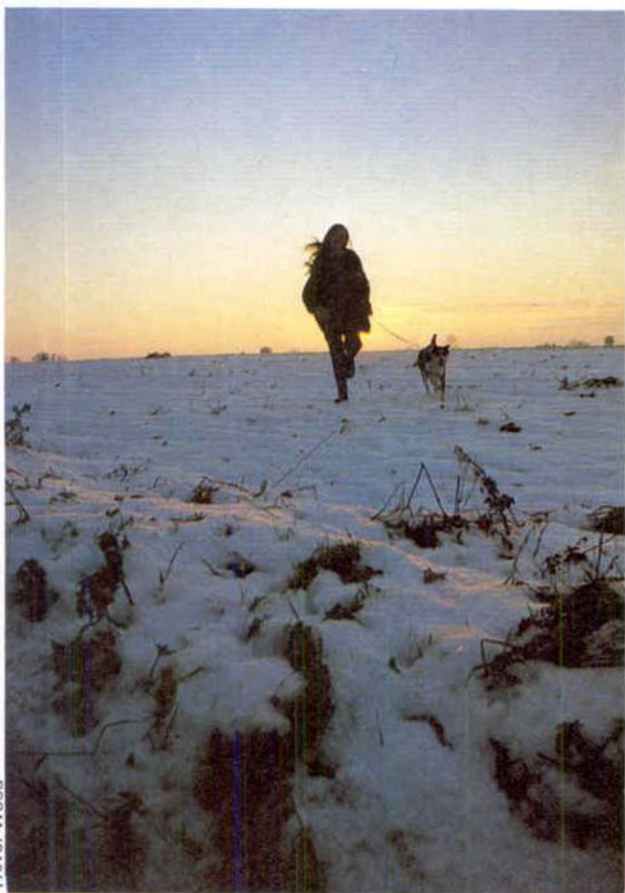


Icy fingers Use the colour contrast of blue skies to highlight spectacular ice forms **Three trees** Watch for silhouettes against the golden skies as the winter sun slowly sets **Winter walks** The low sun angle provides many opportunities **City** Pale winter hues soften the urban scene

Francois le Diascorn/Viva



Trevor Wood



Homer Sykes





Frosted leaf Where there are trees, look under your feet for frost effects

Red door Try including a splash of colour to improve snowscapes



Timothy Beddow



John Sims/Vision International



Barry Lewis

Snow joke Falling snow illuminated by flashlight is a suitable foreground for this evocative candid shot showing the less attractive side of winter

Winter locations

Excellent locations for winter photography can be found in both town and country, but you may have to look harder for colour contrast. You may have to move in closer to the subject and be more selective about your composition.

If you are keen on landscape photography, you will find that in winter the countryside has taken on a completely different appearance. Ice and frost formations can be particularly interesting and you may be able to find some very graphic patterns which will make interesting shots when taken at close range.

Cloud formations can also be very effective in the winter and can be used to add some atmosphere to your photographs. If you are working with black and white film, you may find it useful to use an orange filter to dramatize the effects of the sky. Remember, however, that you will lose valuable stops if you are using yellow, orange or red filters when the light is already dim.

Bare trees are worth including when you are framing a winter scene. They emphasize the gloom and lifelessness of winter and can form interesting shapes when used as silhouettes against the sky. On evergreen trees, close-ups of frosty leaves may make excellent shots.

You can achieve an interesting monochrome effect with colour transparency film by overexposing slightly so the sky goes to white and shadow detail is revealed. The dark trees will contrast with the sky in a similar way to a highly contrasty black and white print.

Fog and mist can be an attractive atmospheric condition to use in your pictures. It can isolate the subject very well while providing an eerie and soft background. It is a useful effect when photographing both in town and in the country. You may be able to get a very

blueness on a cloudy day, the 81B having the greater effect.

A final point to make on the equipment side concerns the effects of extreme cold on your camera. The lubricants used in the camera thicken at very low temperatures and, if you expect to experience such extremes, you should check with the manufacturer to see if it is recommended that the camera should be specially prepared for subzero use. Do not leave a camera in a car on an extremely cold night since this may cause the shutter to jam, or at least function sluggishly. This can be even worse since you may not suspect the fault.

A more common problem is the effect which cold weather can have on your camera's battery. The battery may well fail under bad weather conditions and you should be sure to carry at least one spare with you. The spare should be kept close to your body so that it is allowed to stay warm. If your camera has an electronically controlled shutter, you should be particularly careful about this otherwise only the manual speeds will be useable—and many cameras have only one manual speed, which has its limitations. Keep any batteries which do fail since they can be used in more favourable conditions.

Ice storm Phenomena like this, caused by rain falling in extremely cold conditions, are rare but very beautiful

Winter gloom The heavy skies of winter can form a dramatic backdrop to stark and simple winter landscapes



John Shaw/Bruce Coleman Ltd



Barry Lewis



J. N. Reichel/Agence Top

Snowy way Black bark on the leeward side of the trees contrasts with the white blanket of snow to give a beautifully simple and delicate picture

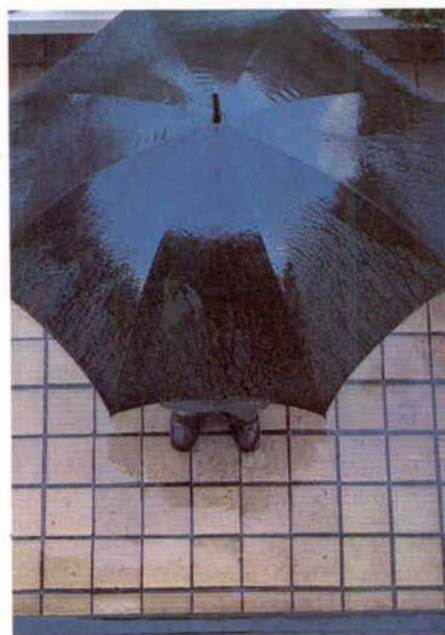
Umbrella Even the dullest rainy day provides opportunities for amusing, almost abstract, candid shots like this man beneath an umbrella

useful shot if you happen to notice an interesting object high up in the background which is completely isolated by a layer of mist covering the foreground.

If you go out with your camera at an early hour on a winter morning you may find a still stretch of water covered with a thin layer of mist. This sort of scene has great photographic potential. Early morning light is particularly rewarding and it is well worth getting up early.

The effect you get, whether beautiful simplicity, overpowering gloom, or something in between, is determined as much by your choice of film as your subject and composition. Black and white materials can help to reinforce the stark aspects of a picture while colour film can add its own effect by supplying life to an otherwise sombre scene.

In winter, do not forget other locations such as the coast. Here you can get shots which are impossible in the summer. Not only do you benefit from the absence of holiday crowds, but also from the unique quality of the light and the bright blue skies which can often be found on the coastline in winter. Although the sea and sky may lack colour brilliance, you may be able to benefit from this by choosing a brightly coloured and well lit subject which can be used to contrast with the dull background. In addition, although the sea may lack colour in the



Michael Freeman/Bruce Coleman Ltd.

winter, the dramatic movement of the waves may make up for this and you can probably get some effective shots using the sea as a background or even as the main subject. Do not overlook lone figures walking along an empty beach since such shapes can often bring life to an otherwise empty scene.

In resort towns on the coast, you also have the opportunity to examine the closed-up piers, amusement arcades, cafés and other places which can take on a new appearance out of the holiday season. Provide contrast to gloomier shots by looking out for a bit of bright colour to use to add interest to your composition. An off-season resort can often be full of colour if you look carefully.

The city in winter

In the town you will also find a wealth of possibilities for winter photography. Winter city scenes are particularly effective when photographed in black and white although you may also want to try colour as well.

Winter gloom is a very easy theme to convey if you are shooting urban photographs. The appearance of wet streets, damp stone and people hurrying around to escape from the elements can all contribute towards this overall effect. This can also be enhanced by technical means if you choose a slow shutter speed so that moving subjects appear blurred. You will have to use a tripod for this kind of shot and you may have to experiment with different camera settings, changing both aperture and speed, to achieve the best result.

Evening shots are well worth trying in the winter. The shapes cast by lights inside houses and buildings can form a pleasing image. And look out for the reflections of large coloured neon signs on wet roads and pavements.

If you have any interest in architectural photography, winter may be a good time to take a second look at buildings which are surrounded by foliage at other times of the year. Without the leaves on adjacent trees you will probably find that you can photograph a more complete view of the building.

No matter what sort of photography interests you, you will find that there are rewarding subjects to be photographed in winter. Indeed, winter can be a time for unique shots and, with a little effort and imagination, you could find yourself producing images that few others have ever thought of photographing—or thought worth the effort.

Leaf shutters

Snapshot cameras often use a shutter in or near the lens, because it is cheap and simple to fit one there. Expensive professional cameras use the same arrangement, but for different reasons

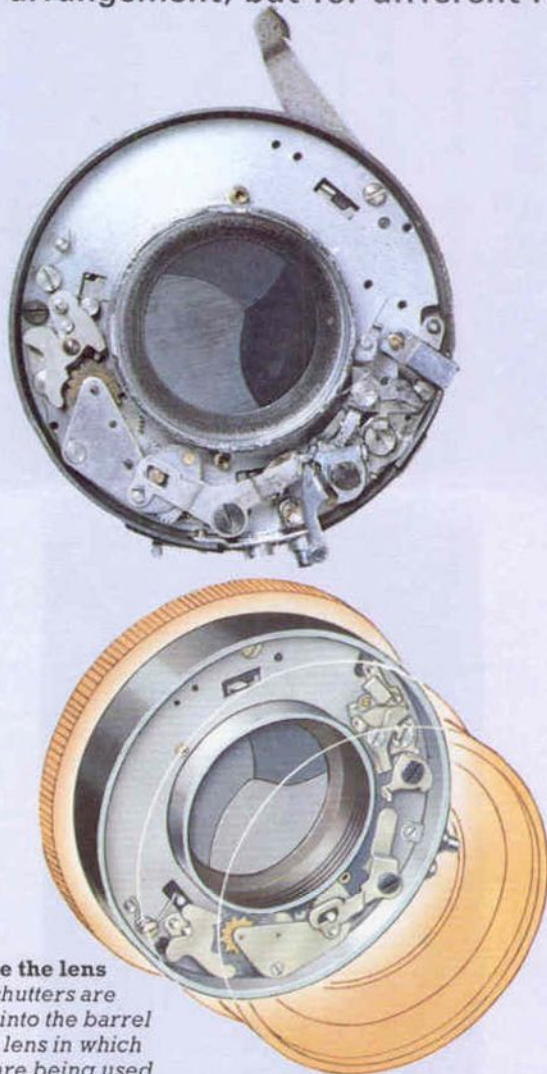
To operate most efficiently, the shutter in a conventional camera must be placed at one of two points. The first of these is close to the film: shutters at this point are known as focal plane shutters (see page 84). The alternative is to put the shutter close to the lens, or inside it, between the glass elements of the lens. A shutter in or near the lens is called a leaf or diaphragm shutter.

There are probably more cameras with leaf shutters than other types. This is because the leaf shutter can be built into simple cameras at very low cost. The old-fashioned box camera has a simple leaf shutter mechanism in front of the lens and its descendant, the 110 camera, has a very similar one.

In its most humble form, the leaf shutter is simply a metal disc which rotates about a pin through its centre. Near the edge of the disc a curved slot is cut, and when the disc is spun, this passes in front of the lens letting light fall on the film. A spring operated device makes sure that the disc always moves at the same speed, so the film gets the same exposure each time the shutter release is pressed. Sometimes these simple leaf shutters have a mechanism which changes the size of the hole in the spinning disc, so that there is a choice of more than one effective shutter speed, but generally there is only one: about 1/40 second.

In order to offer a greater range of shutter speeds, it is

Jon Bouchier



Inside the lens
Leaf shutters are fitted into the barrel of the lens in which they are being used

necessary to make the leaf shutter more complex in construction. More sophisticated leaf shutters have three or more blades made of very thin spring steel, titanium

or plastic. These blades, or leaves, move in quite a different way from their simpler counterpart. When the shutter is closed, the leaves are at rest and overlap each

other. Since they fit quite snugly together, they keep the inside of the camera in total darkness. When the shutter release is pressed, the blades move very quickly apart, uncovering the lens. They remain in this position for the duration of the exposure time, before closing once again.

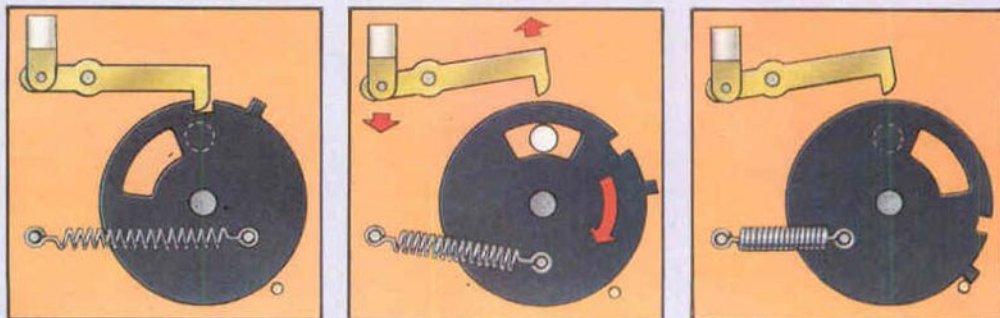
Timing the exposure

The time for which the blades remain in the open position is controlled by a complex arrangement of springs and gears—not unlike a clock—that is built into the mechanism of the shutter. In some of the most modern shutters of this type, the timing is done by electronic means, often using a quartz crystal similar to that found in digital watches.

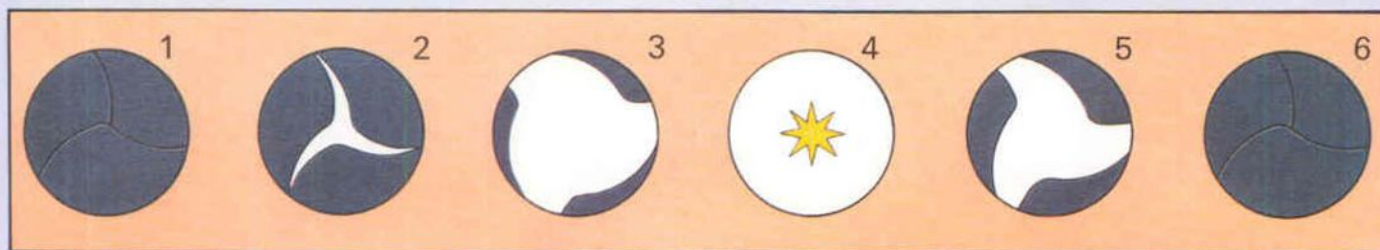
Leaf shutters offer one important advantage over focal plane shutters: they can be used with electronic flash at all speeds. This is not possible with focal plane shutters, which can only be used at fairly slow shutter speeds if they are to work in conjunction with a flashgun.

Leaf shutters are able to do this because the whole of the film is exposed at once, instead of bit by bit (as it is at fast speeds using a focal plane shutter). Once the leaves of the shutter have moved out of the way, the path of the light, through the lens to the film, is completely uninterrupted, and the flash can fire without a shadow of the leaves falling on the film.

Simple shutters Very cheap cameras use a spinning disc to make the exposure. The disc fits just behind or in front of the lens, and has a curved slot cut into it. Normally the lens is covered by the disc, but when the shutter release is pressed the disc spins under spring tension. The slot passes in front of the lens, and exposes the film to light



Paul Williams



Moving blades Some leaf shutters use several thin blades which swing rapidly apart to make the exposure. Because all the film is exposed at once, it is possible to synchronize flash at all shutter speeds

Since leaf shutters are usually built into the lens with which they are to be used, cameras with interchangeable lenses normally require one shutter for each lens that is to be fitted. For this reason, SLR cameras do not use leaf shutters—the cost of a lens with a shutter would be considerably higher than one without—and their use is confined to compact type and larger format cameras. They are used extensively on roll film cameras, and studio cameras, which take sheets of film up to 28 × 35.5 cm, use them exclusively.

Besides expense, there are a number of other problems associated with leaf shutters which stem from the way they

operate. It is not possible to build a leaf shutter that will produce a very short shutter speed, since the leaves of the shutter do not move instantly from a closed position to an open one. Though the time lag is insignificant at slow speeds, it becomes more important when the time for which the blades are open is much shorter. Although the time lag can be reduced by making the blades move more quickly, there is a limit to the speed at which they can be made to open and close.

Few leaf shutters have top speeds that exceed 1/500, and if the lens is used at full aperture the top speeds are lower than those marked. In these circumstances, there will also be an exposure error which is sometimes as high as 25%. However, since it is unlikely that a camera will often be used both at the fastest shutter speed and the widest aperture, these errors are rarely of any importance.



Red Saunders

Daylight and flash Leaf shutters enable a photographer to use flash at fast shutter speeds. This is particularly useful in daylight out of doors, a technique called fill in flash





World of photography

Magnum Photos

One of the world's finest photo agencies, Magnum is renowned throughout the world for the skill and excellence of its photographers



Elliott Erwitt

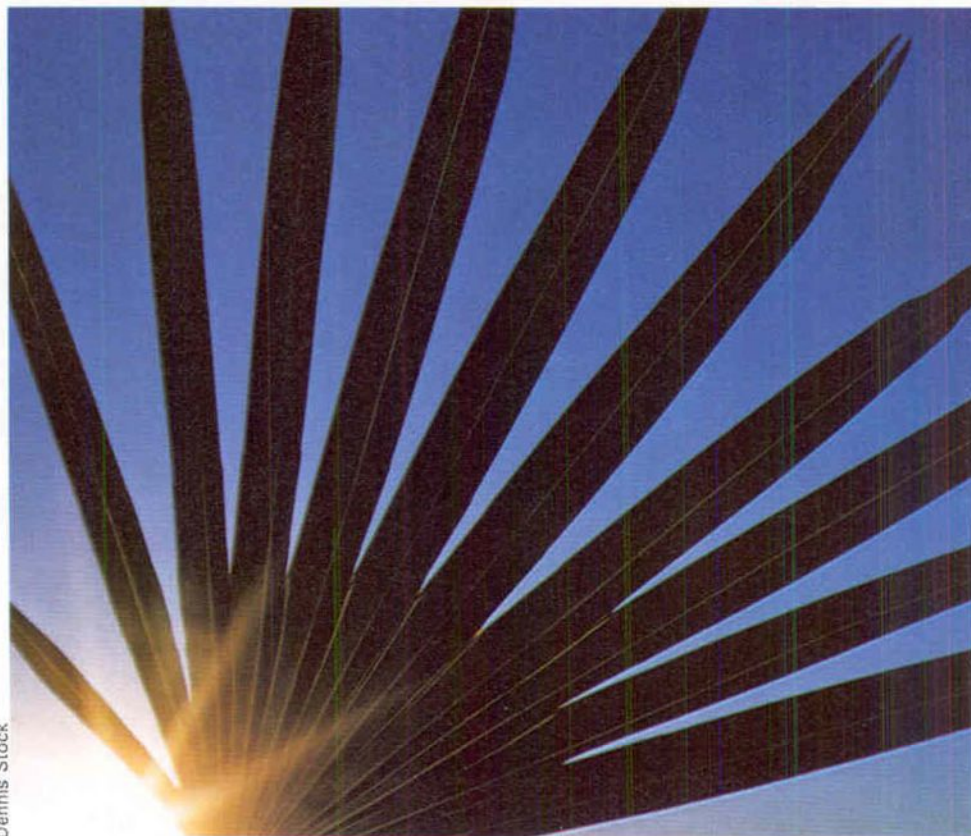
Even if you have never heard the name Magnum, the chances are that you have seen some of the photographs that have made this agency famous.

They include such work as Philip Jones Griffiths' dramatic and touching coverage of Vietnam; Bruno Barbey's stories of China in the *Sunday Times Colour Magazine*; Elliott Erwitt's witty shots of dogs in his book *'Son of Bitch'*; Eve Arnold's haunting portraits of women in the Middle East and the outstanding photographs of Henri Cartier-Bresson.

The work of such photographers, who are generally acknowledged to be among the finest in the world, has made Magnum justly famous. Although it is difficult to generalize about the style of an agency that handles a large group of highly individual photographers, the kind of photography through which Magnum is most widely known and respected is photojournalism—the use of a series of pictures to tell a story.

Photojournalism demands the skills of other kinds of photography—creativity, style and excellence among other qualities—but it also demands other less

Cactus Although renowned for their reportage, many of the group take abstracts like Dennis Stock's superb sun pictures



Dennis Stock

obvious skills. It may require the ability to move easily among widely different groups of people, or to plunge into extremely dangerous situations, for example. But one of the most necessary aptitudes a photojournalist needs is ingenuity—and the ability to resolve seemingly impossible situations.

What distinguishes the work of Magnum photographers, however, is their continuing commitment to their subjects and to the idea of showing people and events as they really are. This commitment is shown in the honesty, wit and compassion of much of their work.

One of the reasons that the Magnum agency is able to exercise such creative flexibility is that it is a cooperative of 28 members who each have a financial share in the agency, and lay down the rules by which it operates. They also decide themselves which new photographers to admit to their ranks.

Independence

Magnum was founded in 1947 by four of the world's leading photographers—Robert Capa, David 'Chim' Seymour, George Rodger and Henri Cartier-Bresson. They had worked for such magazines as *Time* and *Life* during World War 2 but had felt more and more that they wanted to maintain a tighter control over how their work was used. They also resented losing the copyright on their negatives once they had sold a story to a magazine.

The passenger One of the hallmarks of a Magnum photographer is an eye for the amusing—this is from Elliott Erwitt's book of dog pictures

Philip Jones Griffiths



Vantage point Like several other photographers, Philip Jones Griffiths gained a reputation for emotive pictures of the war in Vietnam

In the early days, all four photographers were using Paris and New York as bases, so they set up offices in both cities, and began using their combined skills and experience to sell joint photo-stories to magazines. Their first big international story, 'People are people the world over', was sold to the *Ladies Home Journal* in the US for \$28,000. With other assignments from the *London Illustrated*, Magnum was in business.

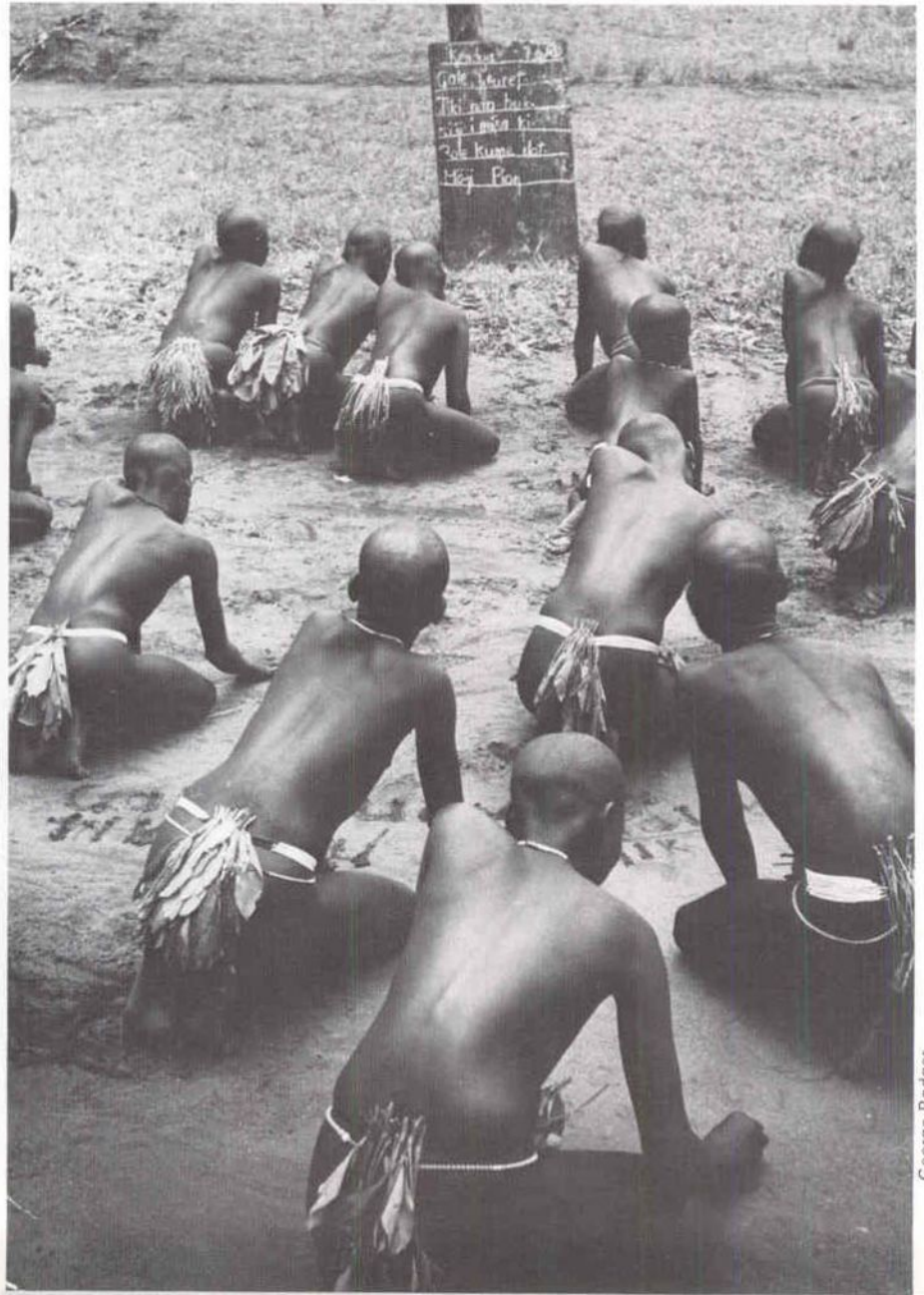
Pulling together

Today Magnum is a big organization. Its offices (usually referred to as bureaux) in Paris and New York both carry large staffs and, besides the 28 full member photographers, there are a number of contributing and associate photographers working through the agency.

Magnum members have included many different nationalities, including French, Polish, Swiss, Czech, Dutch,

They realized that the only way they could continue to do the kind of in-depth photo-stories that they enjoyed, be free of the worst types of editorial censorship and keep control of their copyright, was to form their own agency. Control of copyright was one of their major battles. Magazines used to claim control on all future sales of the pictures brought back from assignments. Often the photographer's work would end up in some dusty basement, never to be used again. Acting as a group, Magnum won copyright to their negatives and so have done much to change the attitudes of publishers towards the rights of all photographers and their work.

Schoolgirls in the Sudan, 1948 An image from George Rodger's notable series of African photographs



George Rodger



Robert Capa



Scorned Magnum's founding father, Robert Capa, was in Chartres in 1944 when this woman, head shaven, was taunted for collaboration with the Nazis

Welsh, English, Japanese, Chilean and, most frequently, Americans. Their backgrounds are also contrasting, for example a barely educated Carolinian farm boy (Burk Uzzle), a Harvard graduate (Burt Glinn) and the son of a Russian-born Buddhist priest (Elliott Erwitt).

It is still run on much the same lines as those worked out by its founding members in the early 50s. The photographers look on themselves as members of a fraternity and give each other plenty of support and encouragement. They also have some of the problems which inevitably affect close-knit groups. Ian Berry, an ex-Vice-President of Magnum, explains: 'Those who think of us as an exclusive club of self-satisfied photographers should be present at our annual meetings. There is no lack of self-criticism and self-examination. The atmosphere can get extremely charged with people shouting, and even throwing things at each other. It's inevitable with a band of people who are so politically, socially and culturally diverse. However, we seem to weather the storms; probably because we are all united by a commitment to photography.'

One of the major storms that Magnum has weathered came about in the mid 60s—from outside, rather than within. The world of communications was changing fast, mainly because of the rise of television. The photojournalistic magazines that had provided Magnum with its major markets began to fold under the pressure

of declining sales.

If Magnum was to survive it would have to change too. At first the agency dabbled in films and publishing, but eventually they, like many others, turned to commercial photography. After a long and especially bitter debate about how



The heat in Harlem A happier side of life, kids larking with a fire hydrant on a hot day in New York, portrayed here by Leonard Freed

many of their original ideals of independent photojournalism they would have to abandon, the majority of the photographers accepted that at least a part of Magnum's income would in future have to be earned through such things as industrial photography and illustrations for company reports. It was a good decision. The photographers found in practice that besides being lucrative, foreign assignments for international companies provided opportunities to do additional work of their own in countries they may not otherwise have visited.

The home base

From the beginning, one of the main strengths of Magnum has been in the efficiency of its back-up organization. The bureaux staff always know where the photographers are, and what kind of work each prefers. The photographer, of course, has the freedom to accept or decline any assignment.

If a big news story happens in some part of the world, the staff at the bureaux consider not only the photographers' geographical locations but also their particular interests or specialist knowledge and contacts. Then the agency will contact possible customers and try to obtain one or two guaranteed contracts for the material, then commission the photographer.

Once work is assigned, the agency may help in the organization of a trip, its bureaux acting as gathering points for

Buddha with the hibiscus Magnum photographers take pictures of many cultures in many parts of the world. This was taken by Bruno Barbey in Thailand



relevant information such as hotels, photographic laboratories or general contacts. After that, the agency's main function is as a collection point for the films as they are sent back. They are then developed, printed and sent out to the particular commissioning client, or directly or through their agents to interested newspapers or journals.

Finally, the negatives are coded and stored and stock material (a selection of prints or transparencies) is placed in the archives. The agency deals with all the invoicing. On the first sale or distribution, the receipts are divided 60 per cent to the photographer, 40 per cent to the agency. After this, all sales from stock are divided 50/50.

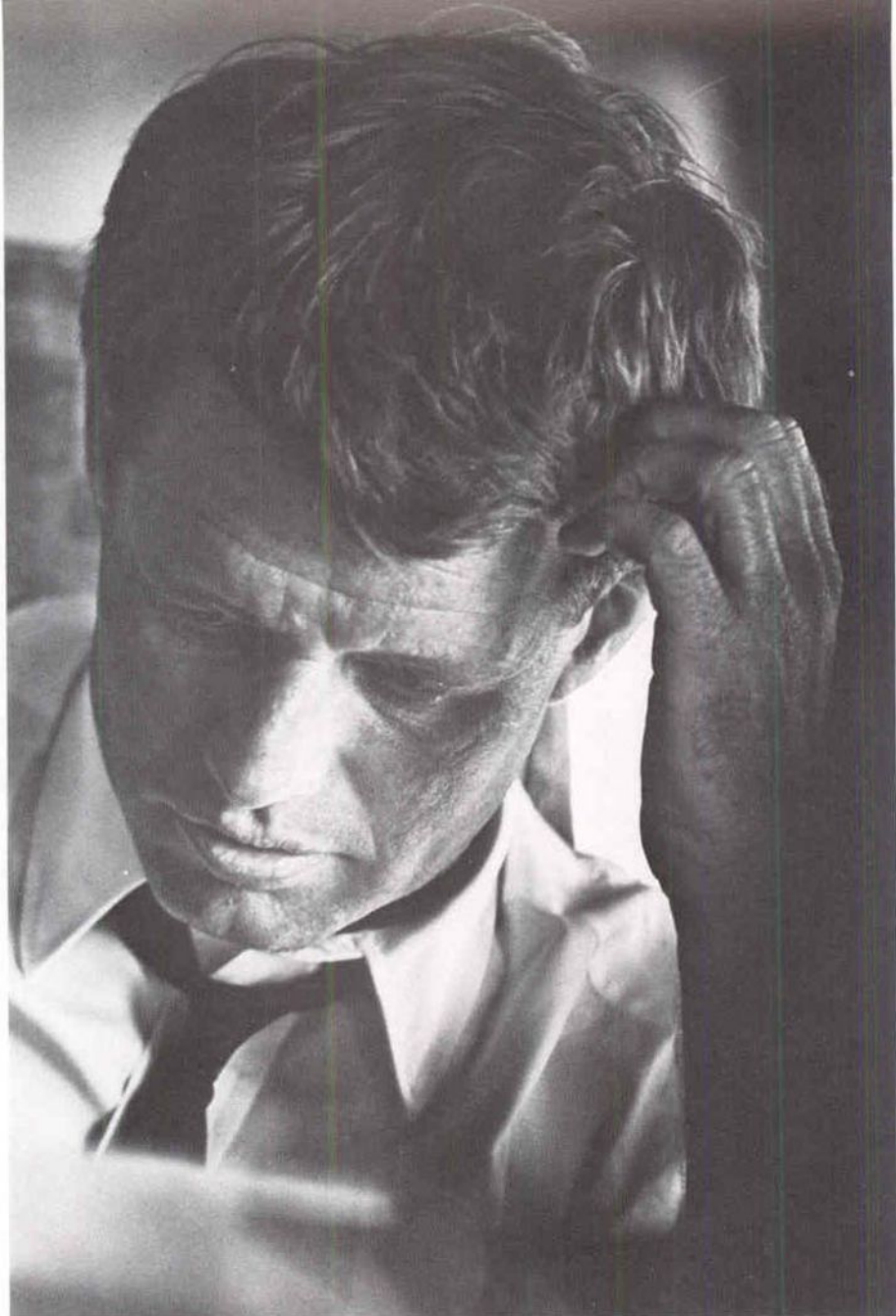
The way in

Magnum's tradition of honest photo-journalism continues to have a strong attraction for young photographers. But as well as being an asset, this is also a source of worry because growing too large would mean losing the advantages of the close-knit group. New young photographers, however, are being considered all the time, but the entry procedure is long and cautious.

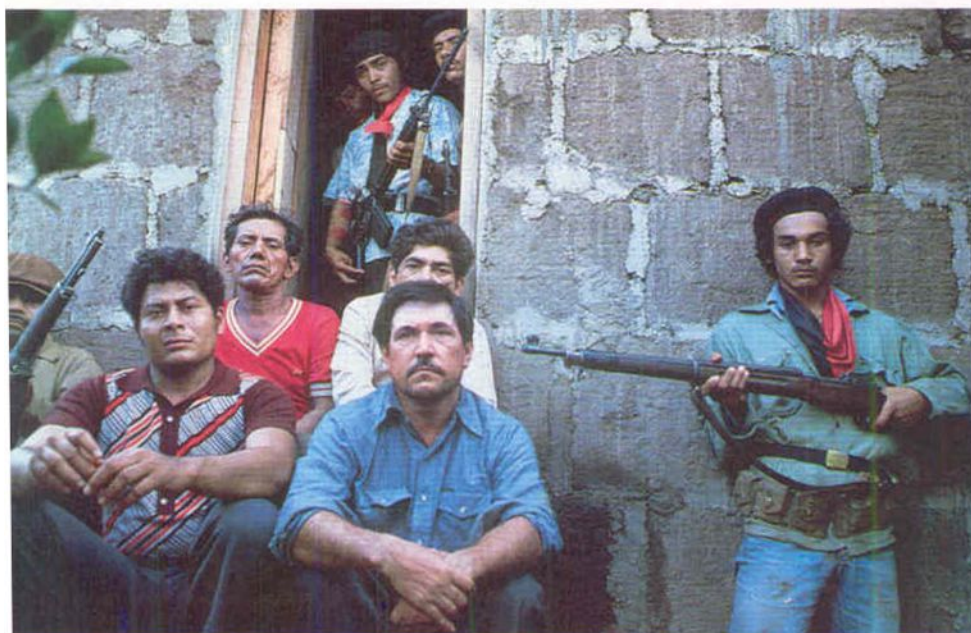
Every year there is an annual general meeting during which young photographers—typically 20 a year—submit their portfolios. Their work is assessed and choices made. If successful, a photographer is first given nominee membership, which usually lasts two years, then associate membership and lastly full membership.

'The problem with belonging to some kind of group', says Philip Jones Griffiths, 'is that people have to be able to pull together. In theory we should all be in competition, tearing each other's eyes out. Those who do behave in this way

Nicaragua 1979 Susan Meiselas took this picture as part of an in-depth photo story on the Nicaraguan revolution



Cornell Capa



The candidate Using a long lens, Cornell Capa caught Robert Kennedy in a moment of repose during a long and tiring electoral campaign

shouldn't be in Magnum. If you have a suspicious nature and don't get on with people, Magnum won't work out for you.

'Our so-called periods of apprenticeship are not just for us to judge the photographers, but for them to judge us—to see if we're right for them.'

Once Magnum and a photographer do decide that they are right for each other, the union is usually rewarding. Being a Magnum photographer is frequently a key that will open an otherwise firmly closed door. It may also give the opportunity to photograph stories that may not be commercially viable. There is a fund (known as IP—Internal Production) which finances such projects. And the earnings are likely to be anything from \$5,000 to \$100,000 a year. That again is the photographer's choice.

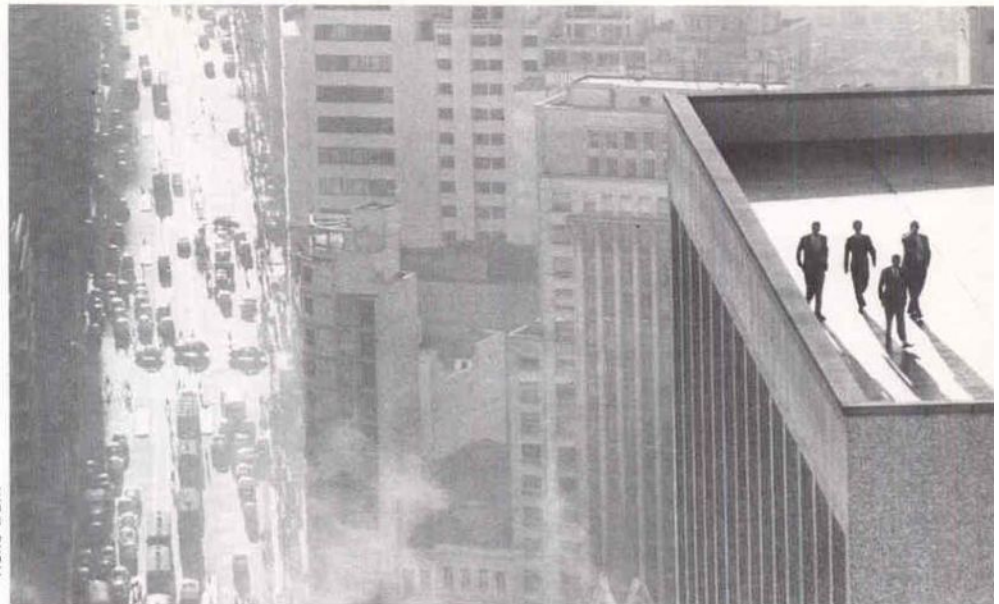
Susan Meiselas

Full Members of Magnum

Eve Arnold, Bruno Barbey,
Ian Berry, Rene Burri,
Cornell Capa, Bruce Davidson,
Raymond Depardon,
Elliott Erwitt, Leonard Freed,
Paul Fusco, Burt Glinn,
Mark Godfrey,
Philip Jones Griffiths,
Charles Harbutt,
Erich Hartmann, David Hurn,
Richard Kalvar, Josef Koudelka,
Guy Le Querrec, Costa Manos,
Mary Ellen Mark,
Susan Meisalas, Wayne Miller,
Gilles Peress,
Marilyn Silverstone,
Dennis Stock, Burk Uzzle,
Alex Webb

Contributing members

Henri Cartier-Bresson,
Ernst Haas, Erich Lessing,
Inge Morath, George Rodger



Rene Burri

Sao Paulo cityscape By including the silhouetted figures in his frame Rene Burri emphasized the vastness of the city's skyscraper canyons

A variety of projects

Many of the photographers find that one of the major advantages of being in Magnum is the freedom that the organization allows them. For someone like Elliott Erwitt, the joy is in being able to diversify his talents and go from one type of assignment to another. One week he may be photographing straightforward product shots for an advertising agency; the next he will be travelling the world taking pictures for a prestigious annual report or maybe covering a news story for a major magazine.

For Eve Arnold a major factor in belonging to Magnum is the chance to undertake the occasional really lucrative job which enables her to carry on taking photographs of the subjects she feels are closest to her heart.

Almost all Magnum photographers have worked on a wide variety of projects. Some members, who are attracted by the financial rewards of commercial photography and the high earnings possible in the agency, welcome the opportunity to do more general reportage or human interest stories occasionally. Others, like Josef Koudelka, are almost exclusively concerned with in-depth reportage where the financial rewards are likely to be low but the personal satisfaction is high.

For all these photographers the personal and professional rewards of working for Magnum far outweigh the costs of giving up a percentage of their earnings to the agency. For they are, after all, contributing to their own organization whose direction and procedures they determine themselves.

May Day in Prague, 1977 Charles Harbutt has used a low angle to isolate the girl from the crowd and thus capture the feeling of the event



Charles Harbutt

Better film processing-2

Temperatures, timing, handling and washing . . . they all affect the quality of your results. Only by taking care at all stages can you get really top quality results

You can get a good print only if you have a good quality negative to start off with. In negative-positive work the negative is the picture, and so it is especially important to see that nothing goes wrong during processing.

Failure to maintain a constant process temperature is one of the commonest reasons for poor quality negatives. For most b & w work, the process temperature is 20°C (68°F), and if the room temperature matches this, there is normally no need to bother with temperature control techniques.

If, however, the room temperature is significantly different, the easiest remedy is to place all the solution containers in a bowl or sink of water at the correct temperature. Do this several minutes before processing begins to allow the solutions time enough to warm up (they must always be stored in fairly cool conditions), adding a little hot or cold



Jon Bouchier

Constant temperatures Use a waterbath to keep temperatures constant through all the process stages

water to the bowl or sink as necessary.

It is particularly important to avoid sudden variations from one solution and the next, so include all solutions in the water bath—including a quantity of rinse-water to start the washing phase.

Always pour developer into the loaded tank as quickly as possible, but without causing undue turbulence. Hold the tank at an angle of about 45° and guide the stream of liquid into the baffle arrangement of the lid.

As soon as the tank is filled, level it and tap the base quite firmly against the work top to dislodge any air bubbles that may have become trapped on the film or within the spiral and tank. Push the lid on firmly, immediately invert the tank two or three times, and then tap the base again. Do this every time you pour a solution into the tank.

Invert the tank once or twice every half minute (or as recommended) to provide sufficient agitation. Standardize the amount and method of agitation to ensure development consistency. Check the temperature of the solution a minute or so into development and make any necessary adjustments to development time when you have consulted the developer instructions.

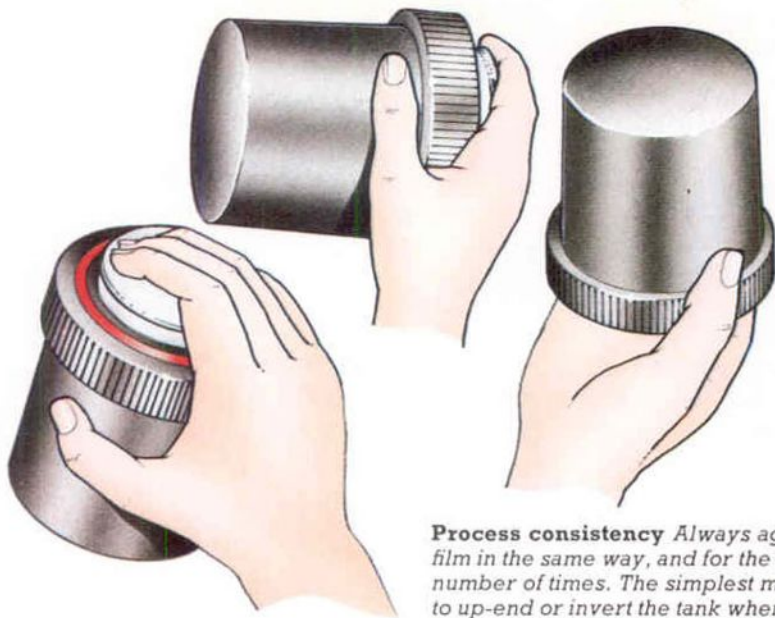
Remember that development continues until ended by a water rinse or, if this is not used, by the fixer itself. Begin emptying the developer 15 to 20 seconds before the end of the development time if development times are so short that this precision is needed. A long development time has its drawbacks too—

Spotted prints This is what dust on the negative looks like when printed. You can wipe it off negatives that are already dry—but dust that settles on a wet negative is there for good

For optimum processing quality:

- Don't touch the film surfaces
- Don't contaminate the developer
- Don't use over-worked solutions
- Don't fix for too long
- Don't rush the washing stage
- Don't process in a dusty environment





Process consistency Always agitate the film in the same way, and for the same number of times. The simplest method is to up-end or invert the tank when agitation is required



Timing is important Development continues for just as long as the solution remains active in the tank, so time the pouring stage and include this in the total process time especially when this is brief

correct agitation technique is particularly important, and temperature control assumes a new significance.

When the developer is out, pour in the intermediate rinse water straight away. It is important to agitate the film thoroughly for a minute before discarding the rinse in favour of fixer.

You can of course jump straight to the fixing stage but developer carry-over tends to exhaust the fixer bath more rapidly—and, unless your technique is tip-top, with certain types of film and developer there is a risk of chemical fog or staining.

The use of a *stop bath* instantly arrests development and, by neutralizing the alkalinity of the developer, helps prolong the activity of the fixer bath which immediately follows. You use stop bath in exactly the same way as a water rinse: one minute with continual agitation. You can make up your own from a 3% solution of glacial acetic acid or buy ready-



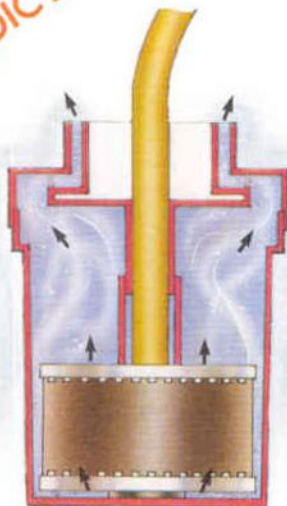
Temperature drops Avoid sudden temperature changes, especially by going straight to a cold wash, as this stresses the emulsion, so causing 'crazy paving' cracks (a fault called reticulation)



Jon Bouchier

Washing efficiency You can use a hose arrangement to increase the flow rate of water over the whole film area, thus improving wash efficiency and reducing the time washing is necessary

topic



Fixing does not simply prevent film from going black in the light. The problem is that unexposed, undeveloped silver halide—the light sensitive ingredient of film—normally does not dissolve in water. The fixer's job is to turn it into a compound that will do so. Having done this, it is necessary to wash away all traces of the compound so that there is no risk of further action taking place. A badly fixed film (or print) runs the risk of turning yellow after a while, with the image eventually bleaching away.

The washing time is affected by several different factors. Washing efficiency depends on the rate of change of water which comes into contact with the emulsion layer, and the best method is to use a hose attachment to force water into the base of the tank so the overspill carries away the waste. The whole film is washed in this way. If you do not have a hose attachment (and not all tanks can be fitted with one) leave the opened tank in a sink beneath a running tap but make a point of turning the

spiral over during the course of washing.

Alternatively, remove the spiral from its tank and adjust the flow of tap water to the discharge rate of the overflow of the sink. Be particularly careful to see that the film remains on its spiral for the duration of the wash by taping down the end or encircling the spiral with an elastic band. A loose film can easily be damaged by a plug chain, and there is always a danger that it could enter and block the overflow pipework.

If you cannot provide a running water wash use ten or more individual baths over a corresponding time agitating the spiral and film forcibly in each.

Increase the period of wash slightly if you live in an area which has a particularly 'soft' water supply as there is a good chance it may be slightly more acid than normal. Wash efficiency is better where water is 'hard' and alkaline, as this more quickly neutralizes the acid nature of the fixing baths in use today.



Wetting agent After washing, add a few drops of wetting agent (not detergent) to the final rinse water. This helps the film to dry evenly

prepared concentrate which needs considerable dilution. The commercial product is likely to contain an indicator chemical which changes colour when the stop bath is nearing exhaustion. Always mix stop bath in a well-ventilated room.

Pour in the fixer and agitate the tank continuously for half a minute, and subsequently invert the tank two or three times each half minute. If the film is still slightly milky in appearance at the end of the claimed fixing time, replace the spiral in the tank and continue fixing for no more than, say, twice the claimed fixing period. Better still, discard what is obviously well-exhausted fixer and prepare a fresh batch for immediate use.

Wash and dry

Washing is an important part of any process as it removes potentially harmful salts and by-products which can greatly affect the permanence of an image. Washing time depends on the type of fixer used—a *hardening fixer* requires at least half an hour under conditions that provide for a continual change of water, while *non-hardening fixer* needs about half that.

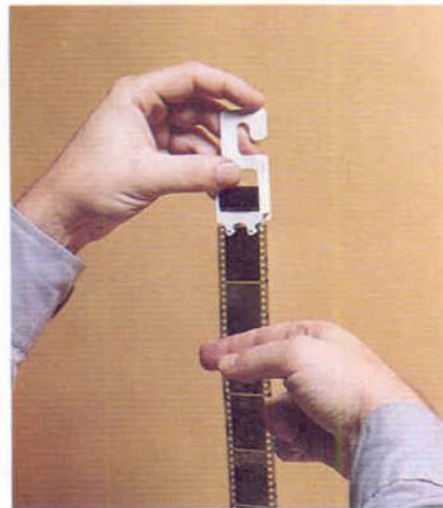
If you do not have access to running water and a sink with an overflow, use ten or so separate changes of water over the same duration and vigorously shake the spiral during each.

If you cannot resist the temptation to peek at your film after fixing, make sure it is reloaded properly before washing commences—a sink plug chain can do irreparable damage to the film emulsion, which is particularly delicate at this stage of the operation.

The temperature of the washing water is also important. If the water is at 15°C instead of at about 20°C, increase the washing time by at least 50 per cent. If washing times do present a problem, consider using a hypo clearing agent solution manufactured specifically for this task—but follow the instructions on use carefully. A brief wash follows.



Avoid damage Attach film clips for drying the film as you remove film from its spiral. An unwound 36-exposure film is about 1.5 m long—and easily damaged



Finger wipe If water does form streams and droplets when you hang the film up to dry, dampen your fingers and wipe down the film to remove the excess



Prevent scratches Rubber-bladed wipers can be used to remove almost all surface moisture but you must inspect and clean the blade each time before use

Use wetting agent at the end of the wash to encourage even drying and to discourage the formation of scum marks. Add 1 ml of wetting agent to each 200 ml of the final rinse. You can do this more easily by diluting your bottle of wetting agent with nine parts of water and adding 10 ml of this to each 200 ml.

Do not use washing-up liquid instead of wetting agent—it is too concentrated and often contains additives which leave smears on the film after drying. Even if these are easily removed by wiping, it does mean more handling of the film so increasing the risk of scratches.

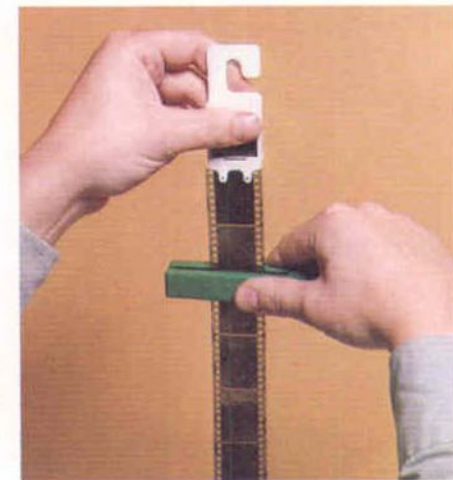
At the end of the final rinse, shake the spiral to get rid of excess liquid then remove the film and hang it up to dry in a dust-free place, using a weighted clip or clothes peg at the bottom to keep the film taut at all times.

Ideally, leave the film to dry overnight in such a place as the bathroom when there should be little domestic traffic. If you are worried about dust—and remember the film is particularly susceptible to dust at this stage—run the shower, if you have one, for a few minutes beforehand. Do not smoke as ash is particularly harmful.

If you have used wetting agent, there is no need to use a squeegee, or for that matter your fingers, to wipe down the film. The latter method is to be preferred as minute grit particles can become trapped in the rubber blades of a squeegee, and cause very severe tram-line scratches unless the blades are carefully cleaned.

When the film is dry, cut it into strips and put these away safely. The best means of storage is in purpose-made sleeves or envelopes. Mail envelopes are suitable only for temporary storage.

In summary, consistent negative quality depends on consistent and clean working methods. Establish a system of working and stick with it. Use the same combination of film and developer, and get to know what you can do and what can be done with this combination.



Wipe down Always start at the top of a film and restrict the wipe to a single, continuous stroke for the whole length of the film

Improve your technique

Wide angle lenses

A wide angle lens is an essential piece of equipment when you want to cover a large area or are working in confined spaces. These lenses also have special characteristics which can be used to good effect



Jerry Young

positioning the camera in relation to the subject.

As well as having a wider field of view, wide angle lenses are also noted for the great apparent depth of field which is created at all apertures. The shorter the focal length of the lens, the greater the depth of field. So even though the maximum apertures of wide angle lenses are almost as large as those of standard lenses, you still get a wide depth of field and focusing is therefore less critical. This quality allows you to take characteristic wide angle shots with a subject and its background both sharp.

Short focal length lenses like these do not, as is often believed, actually change perspective. The close viewpoints allowed by such lenses can cause perspective effects which look distorted but

Great depth of field is characteristic of a wide angle lens, helping make both foreground and background sharp.

Interior shots are also easy with these lenses, especially if space is confined and you cannot move backwards

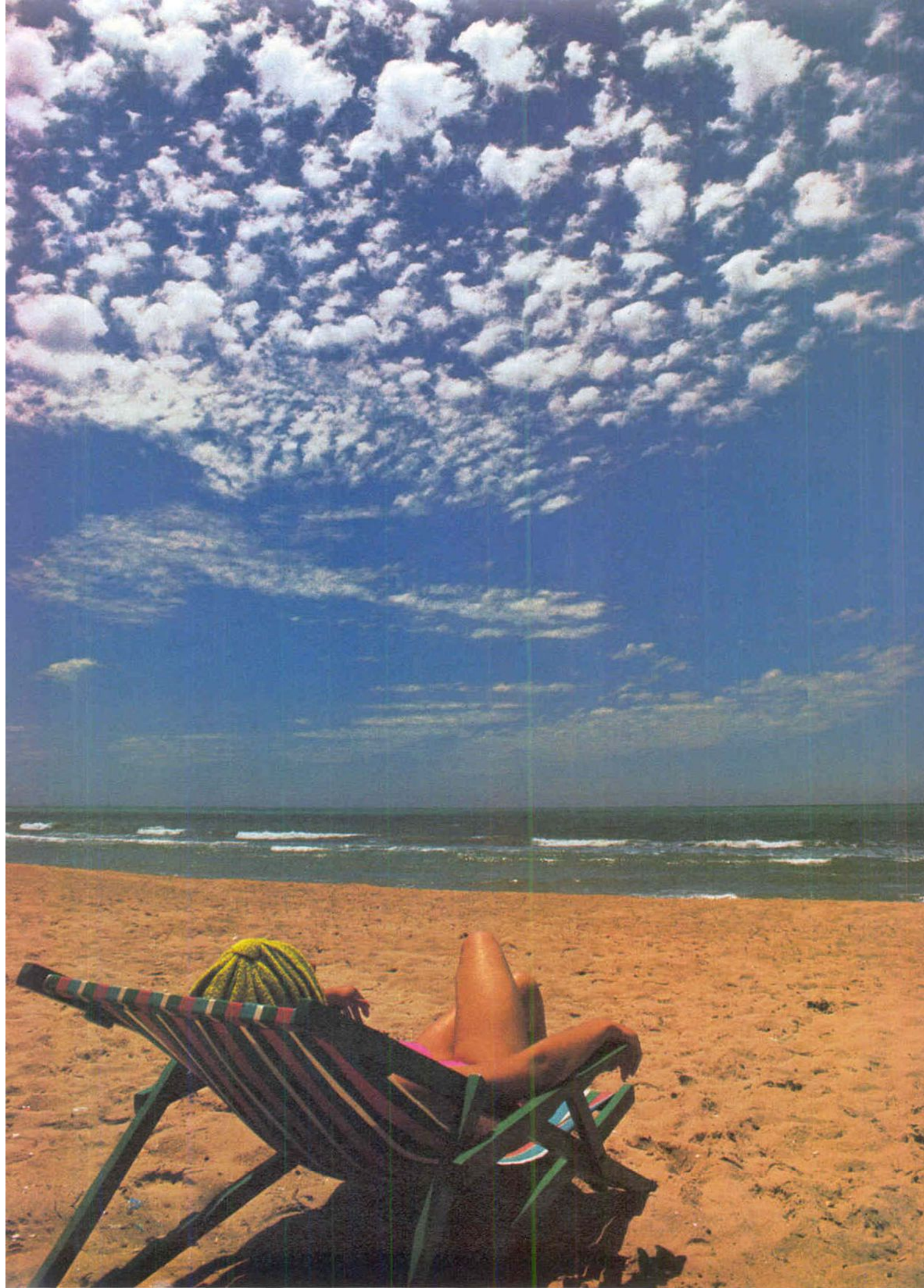
A wide angle lens is designed to take in a large view and is indispensable when working in confined spaces or when you want to cover a large area. These lenses also have their own qualities, causing apparent distortion and foreshortening so that objects closest to the lens appear large while the background diminishes in size dramatically.

Although a 35 mm focal length lens used to be considered a standard short focal length lens, the wide angle group now includes anything from about 24 mm to 35 mm. Any lenses with a focal length less than 24 mm are considered to be ultra wide, or even fisheyes, and these have their own special properties.

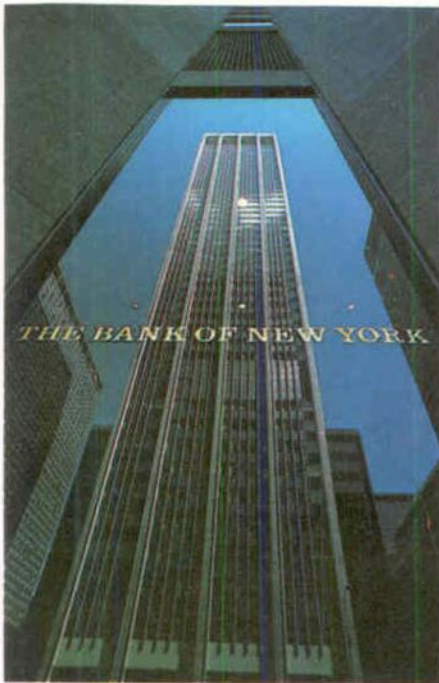
Many people choose a 28 mm lens as their preference for this type, partly because these lenses are reasonably priced, but also because they allow the typical wide angle effects without easily giving apparently distorted images, such as bent walls. A 35 mm lens is very close to the standard 50 mm lens—so much so that many photographers choose one as an alternative standard lens. With lenses which have a wider field of view than that of a 28 mm, it is much easier to create unusual images with abrupt perspective and more care is required when



Jerry Young



Jerry Young



Buildings are ideal subjects for wide angle lenses. Even though the verticals converge, the whole area is covered. Festive table Bystanders are unaware they are in view with a wide angle lens

which are perfectly natural ways of viewing objects at close range. The perspective is the same for the human eye under such circumstances, although your eye corrects this apparent distortion for you. To appear realistic, all wide angle photographs should be assessed at slightly closer viewing distances. If you hold the print or transparency closer to your eye, you will find that any perspective distortion appears more natural.

The apparent distortion which can be created may be used to advantage and many people are attracted to using such a lens because of this. While the human eye is capable of a wide field of vision, a short focal length lens can do this holding all areas of view sharply in focus.

Field of view

Like all other techniques the use of a wide angle can be overworked, so be selective about when you choose to fit this sort of lens. A 50 mm standard lens takes in a 46° field of view while a 35 mm lens takes in 63°. The field of view widens progressively after that so that a 28 mm lens takes in 75°, a 24 mm 84° and, moving into ultra wide angle lenses, a 20 mm takes in 94°. Regardless of which lens you use, this wider coverage is bound to have a number of useful applications.

Wide angle lenses excel in confined spaces. When you want to include a large coverage in an interior shot, this type of lens is the only choice. For many

Summer sky A wide angle lens brings in much more of the sky than a standard lens. You can use the clouds as an element in the picture

ordinary shots you can manage with a 50 mm lens by just walking farther back, but this is usually impossible to do in confined spaces. Similarly, a wide angle lens is ideal for photographing a large building, especially if you want to include the whole of the subject in your shot but wish to avoid the foreground distractions which may be inevitable if you have to stand well back and use a normal lens.

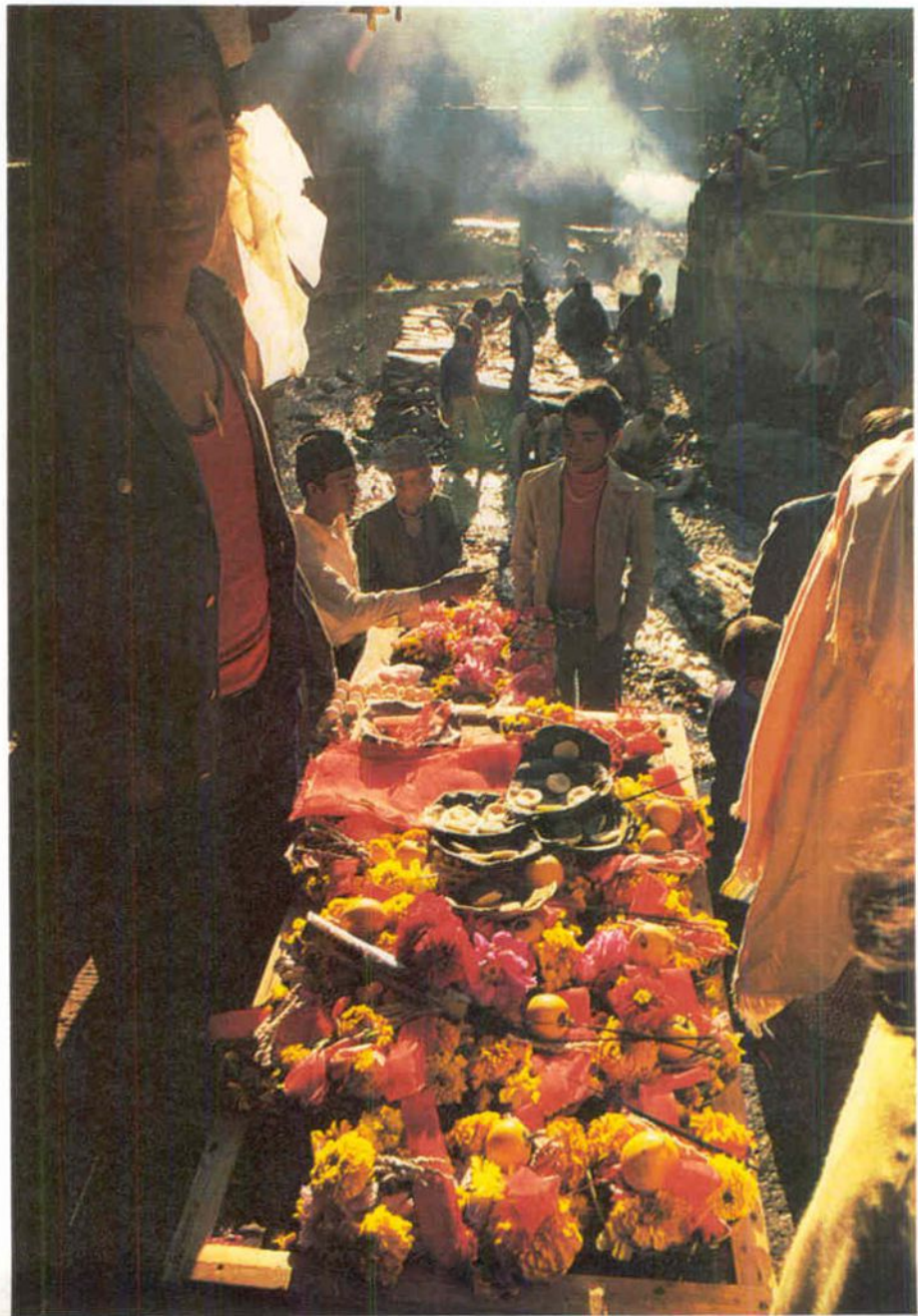
These applications can, however, all cause difficulties. The most common problem is that of foreshortening, which causes verticals to converge so that tall buildings appear to be leaning back. This happens because objects close to the camera appear larger and those in the distance appear smaller. By keeping the camera back vertical you can avoid this effect, but tilting it back to include the upper part of a tall building gives this convergence. The only easy solution is to stand back farther if the shape of the subject is still too exaggerated for your liking. The viewfinder indicates exactly the sort of results which you can expect.

Foreshortening can be effective, however, and you may be pleased with the effects you get, such as when standing close to the base of a tall building.

Convergence can be avoided by using a special type of lens whose operation is based on the flexibility found in a technical camera. Such a lens is known as a *perspective control* or *shift lens*. It works on the principle of keeping the camera film plane parallel to the subject and shifting the lens upwards off its axis. Such equipment is expensive and is only worth considering if you intend specializing in architectural shots.

Wide angle composition

In all types of wide angle photography you will find that even a small change in the position of the camera has a dramatic effect on the composition of your picture. Experiment by trying different heights and angles, but remember that foreground details will be large and backgrounds will recede into the distance rapidly if the viewpoint is a particularly close one.



Jerry Young



By taking in such a wide area you will have to think more carefully about the composition of your photograph as a whole. The main subject will usually be surrounded by a wide background area which must be selected so that it enhances the overall picture.

While the different possibilities available with a wide angle lens are as varied as those with any other type of lens, there are subjects and techniques which are particularly suitable.

For example, wide angle lenses are useful for candid photography since focusing is less critical and there is less chance that part of the subject will be excluded from the frame when taking a spontaneous shot. It is also possible to photograph a person without his realizing it by appearing to shoot past him. Your subject is unlikely to realize that he has been included in your picture, let alone that he is actually the main subject of your photograph.

When taking this type of photograph, however, try to avoid including anything that is important to your picture in the corners of the frame. There is a strong tendency, especially with the wider lenses, for the corner details to be stretched so that their shapes are distorted. If this happens to someone's face, the effect can be particularly distracting. Photographing people with wide angle lenses can also give unflattering results if the shot is taken at close range. Facial features will be exaggerated so that the closest part of the face to the lens, usually the nose, will be out of proportion to the rest of the face. This problem is worse with very wide angle lenses, so these should not be used for close-ups unless you want a special effect.

When using wide angle lenses for landscapes, take care that the main part of the scene does not appear too far away so that all detail is lost from the image. Wide angle landscapes are particularly effective when a foreground subject is used so the frame is filled with a balance of foreground and background details.

These lenses are also particularly useful for composing the subject within a frame, whether it is a door, a window, two trees or whatever strikes you at the time. By using a small to medium lens

Vignetting is easily caused if you use the wrong sort of filter or lens hood with a wide angle lens, especially at wider apertures

Longhorn A careful choice of viewpoint when using a wide angle lens can turn an ordinary scene into a dramatic shot. While a person's face would be distorted, the animal simply becomes more striking



aperture you can keep both the frame and the background scene in focus. One of the most common faults with wide angle lenses is the unintentional foreshortening of the subject. This can be effective, but if you want to avoid it, pay close attention to the position of the camera so that the film remains parallel with the subject.

Precautions

With a wide field of view, a lens hood is an important accessory. Strong lighting can easily end up causing flare when reflected internally between the lens elements, and unless you take proper precautions you can spoil your shot. Sometimes you will be able to see flare or ghosting in the viewfinder but, more often, it is not visible to the eye and will only show up on the film. Of course, such an effect, even if unintentional, can sometimes make a photograph.

Another precaution to take with wide angle lenses concerns filters and other accessories screwed into the threads in the front of the barrel. If you use more than one filter, or you use a particularly thick filter, you may end up with vignetting problems. These result in the edges of the image being cut off, particularly at wider apertures. This problem is common with lenses of 28 mm or wider and you should try to use only filters and hoods recommended by the manufacturer. Polarizing filters can be

very effective when used on wide angle lenses since it is likely that a wide expanse of sky will be included in outdoor shots. These filters tend to be thicker than ordinary ones, so be particularly careful to choose one which does not cause vignetting.

Exposure control and focusing also need care when using wide angle lenses. The wide area of composition of a wide angle photograph often includes a variety of light levels. If a large amount of sky or shadow is included, make sure that you compensate for this with your exposure. Take a reading directly from the main subject and then use this setting for the whole shot. If you are using an automatic camera, switch to 'manual' or use the memory control.

Focusing can also cause problems since it is harder to see whether images in the viewfinder are sharp or not. Although focusing is less critical, especially at small apertures, you still have to take care if you are to be sure of sharp results. If you have a camera with a split image focusing screen you will find the job easier.

Wide angle lenses can be of great help in extending your technique. Make sure however that you are particularly careful over composition and when arranging your main subject in the viewfinder remember that both the foreground and the background are going to form important parts of your picture.

Fay Godwin

An unmistakable style is the mark of a good photographer. Sombre or bright, Fay Godwin's impressive landscapes all have the feeling that they are being gazed on by the human eye for the first time

To Fay Godwin, photography once meant taking occasional snapshots of her children for the family album. Today she is accepted as one of Britain's foremost landscape photographers.

In the space of ten years, Fay made more than just a commercial success of what is still also a hobby. And to her, the darkroom is as important as the camera.

Photographing her children gave Fay a great deal of pleasure, and it soon became apparent that she had a talent for taking lively, natural-looking pictures. This led to her taking pictures of friends' children, and then of the friends themselves.

Some of Fay's friends were writers, and it wasn't long before her photographs were being used to illustrate reviews of their work in newspapers and magazines. They soon appeared on book covers illustrating their biographies and in publicity handouts, too.

It was in the early 70s that, encouraged by her success, Fay decided to try putting her photography on a more serious, professional footing. She put together some of her best pictures to make a brochure which she then sent out to possible customers. This resulted in commissions from several large organizations to take pictures for 'corporate image' brochures and annual reports—pictures of their executive staff.

But the plush offices of multi-million pound corporations are a very different world from the wild, windswept and often muddy landscapes that have become so associated with her. So what made Fay desert the comfortable life?

'I have always loved walking,' she explains, 'and after a walking holiday in the Lake District in 1973 it occurred to me that there was a need for a series of guides to interesting walks in the countryside around the London area.'

The book which she produced, with the text written by JRL Anderson, was *The Oldest Road*, published in 1975. Subtitled *An Exploration of the Ridgeway* it is a walker's guide to the Ridgeway, the ancient road that winds across the downlands of southern England. As a result of this book, and others that she has since produced in collaboration with various writers, such as Richard Ingrams and Ted Hughes, Fay is now best known for her pictures of the British landscape. She still retains an active interest in portrait photography, however.

Landscape photography may sound like an easy and enjoyable way of making a living, but, in fact, to take worthwhile pictures for books like Fay's involves a great deal more than just

Family snap Fay Godwin's two sons and their father taken at sunset on holiday in Spain. Nikon with a 50 mm lens



Fay Godwin

wandering around the countryside taking snapshots of pretty views. To start with, Fay spends a lot of time reading books about the history, culture and geography of an area, and she studies the relevant Ordnance Survey maps, too, to help her gain as thorough a knowledge as possible.

Then comes the field work—driving around the area, followed by hours of walking over rough countryside, trudging up and down hills looking for the shots that she wants. Gaining access to the places she wants to photograph has rarely caused Fay any problems, but she keeps well away from any field with a bull in it!

'You can never be sure how a bull will react to you, even if it's among a herd of cows.'

Equipment

Fay's earlier pictures were taken with a 35 mm camera, but she later acquired a Linhof—finding the clarity and resolution of the larger format a great advantage for landscape photography. The Linhof, however, is a heavy camera to carry for long distances over rough country, so today most of her landscape pictures are taken with a Hasselblad roll film camera, usually with a 50 mm Distagon lens, which on that format gives moderately wide angle views. She still



Jon Bouchier

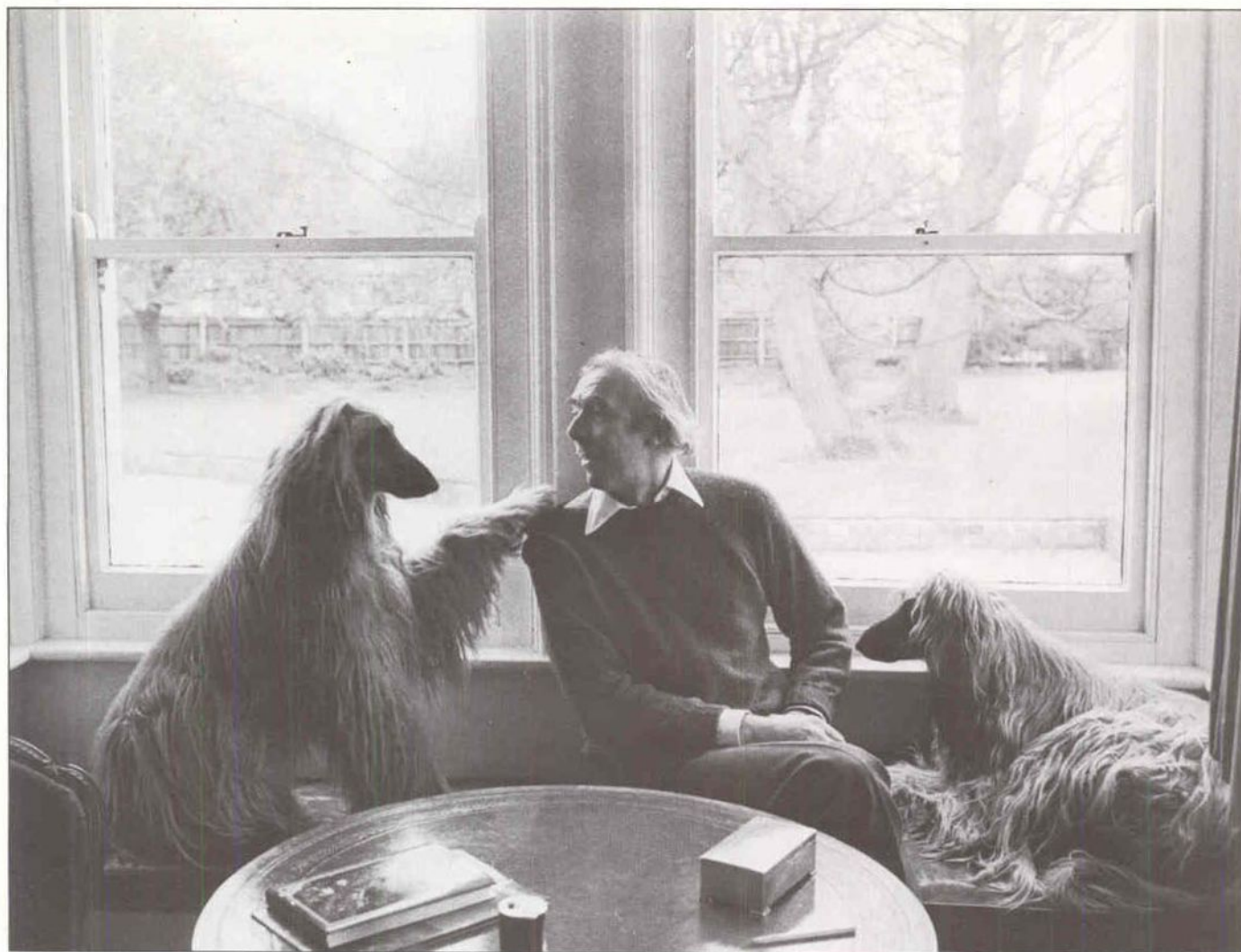
Early morning mist on Avebury Ring stones made it worthwhile for Fay to get up at 4 am with her 6 × 7 cm Linhof

Frank Muir Fay's ability to capture a personality is shown by this portrait of the broadcaster

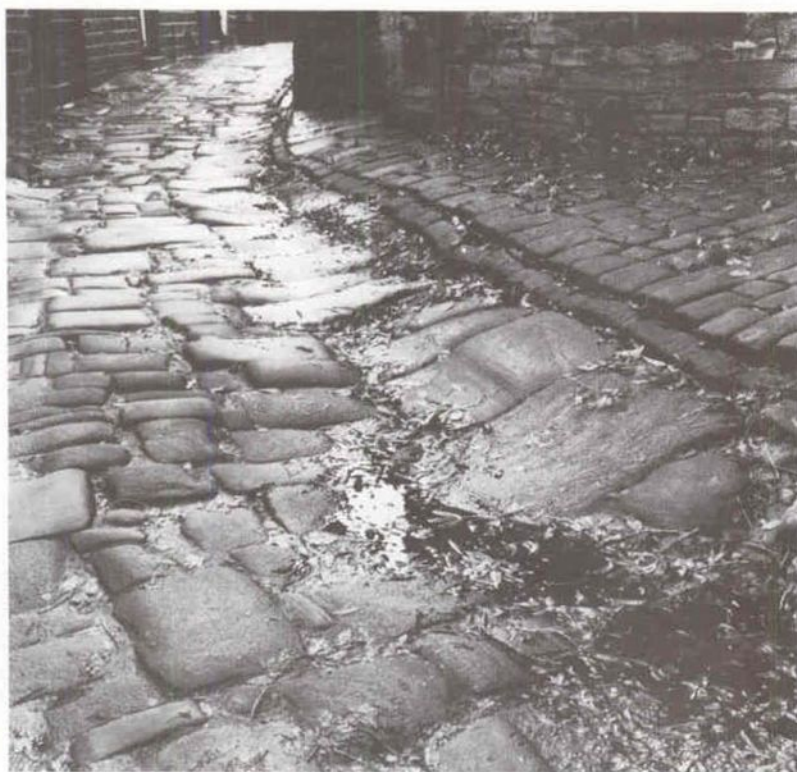
Sunset backlighting over the misty Calder Valley adds a mystic touch to a well-composed landscape

After the rain Gleam and shade on the cobbles was just right for Fay's well angled low shot





Fay Godwin



uses a 35 mm camera for her photo-journalism, and often takes the Linhof along for landscape shots when the location is easily accessible by car.

For her black-and-white photography, which comprises the bulk of her work, the films Fay prefers are Agfapan 25 (a very fine grain film which she rates at 12ASA), Plus-X, Tri-X and FP4. She does her own developing and printing in her well-equipped purpose-built darkroom, and applies the same perfectionism and attention to detail to this part of her work as she does to taking the pictures themselves. 'I really love printing,' she says, 'and controlled print quality is essential to my work.'

Fay uses Ilford paper for her normal prints, but for the fine prints she produces for her exhibitions she uses Agfa Record Rapid, a paper not generally available in Britain. A set of exhibition prints from her Ridgeway series has been acquired by the Victoria and Albert museum, testifying to the excellence of her work.

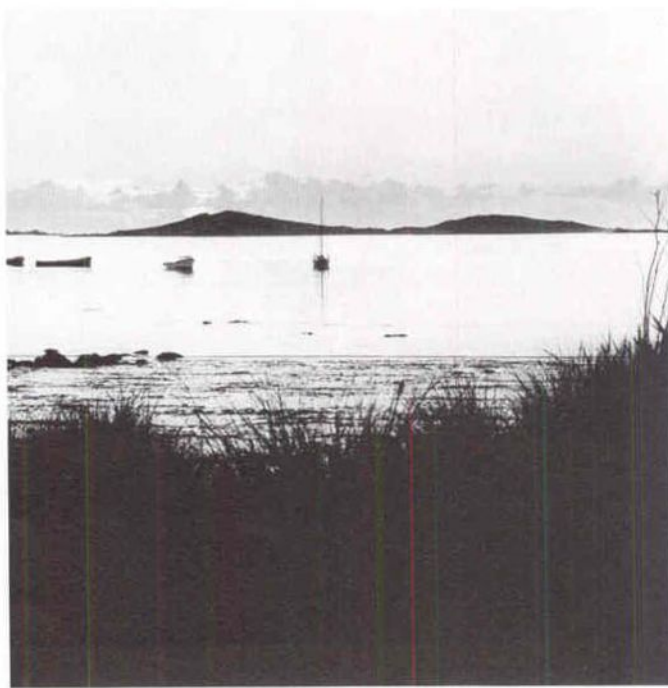
Although she has made her name with black-and-white photography, Fay is no beginner when it comes to colour work. Now that she has adequate darkroom facilities, and can exert the same degree of control over her colour processing as



Mount Zion Baptist Chapel on a very cold winter afternoon. Fay was attracted by the eerie light, and exposed for good shadow detail

In colour A cover shot for a book of Fay's photographs on Romney Marsh. Light nicely balanced with shade, and land with sky and water

Scilly Isles at sunset, shot with a Hasselblad and 80 mm Planar lens, for a John Fowles book on islands which Fay illustrated with her photographs





Fay Godwin

Squall on the Ridgeway in Berkshire.
Ektachrome 64 in a Linhof 6 × 7 camera.
'I forgot what that cloud portended, so suddenly I was soaked to the skin'
 she does over her black-and-white, she is less reluctant to use colour.

Fay uses Kodachrome for most of her colour work, especially on what she calls 'Kodachrome days', when the light is soft and misty and the landscape and sky are subtly pastel-shaded. In winter, however, she finds that she gets better results with Ektachrome, which is also available in large format size.

Out and about

When Fay is out in the countryside shooting landscapes, she is usually equipped with her Hasselblad on a tripod, plus a 35 mm Nikon which she uses to grab those unexpected shots, of animals for instance, that must be taken quickly.

This is not to say, however, that taking landscape shots with a tripod-mounted camera is a leisurely task. And, although having chosen her subject and set up her camera, Fay waits (maybe for hours) until the light, the clouds, and the shadows are just as she wants them. When the right moment comes there is no time to lose—if you have waited so long for

something which may be gone in less than a minute, you can't afford to mess about. 'I have to work as fast on landscapes as on any other type of photography, because the light changes so fast,' Fay explains.

She will often visit a location time and time again, perhaps over a period of many months, until she gets the shot she wants—the one she knows almost by instinct is there waiting to be taken. 'There is very much an intuitive aspect to it,' she says. This perseverance is usually well worth while, as Fay finds out: 'I often get my best pictures towards the end of a project—everything just seems to come together.'

She doesn't usually bracket her exposures, but she often takes back-up shots with filters, using a yellow filter on sunny days and an orange filter when it is dull or overcast.

Selling the pictures

Fay has co-authored two other walkers' guides apart from the Ridgeway book—*The Drovers' Roads of Wales*, with Shirley Toulson, and *Romney Marsh*, with Richard Ingrams (better known as editor of the British satirical magazine *Private Eye*).

In a somewhat different vein, when

John Fowles was writing a book about islands he asked for Fay to collaborate with him. The result was a dramatic series of pictures of the Scilly Isles. Even more unusual is *Remains of Elmet*, in which Fay's powerful images of the Calder Valley in Yorkshire are accompanied by poems by Ted Hughes that were inspired by her pictures. Her major piece of photojournalism so far has been *The Oil Rush* (with Mervyn Jones), an account of the impact that the oil industry has had on life in Scotland, for which she used a Leica. Still maintaining her original interest in portraiture—Fay has taken, among many well-known subjects, author/vet James Herriot, novelist Edna O'Brien and artist David Hockney.

In addition to Fay's income from her books, as a professional photographer a steady income from sales of her pictures to other books or magazines is vital. She has found a good agent to look after these picture sales, and her exhibition work is handled by Anthony Stokes and the Photographers Gallery. She recommends using agents, although she feels that there are not enough good ones around. As she says, echoing the feelings of most professionals: 'I want to spend my time on my pictures, not on negotiations.'

Film contrast

The degree of difference between tones in a photograph—contrast—can have a considerable effect on the success or failure of a shot. So measurement and control of contrast is vital to the photographer

As a camera user you know something about *contrast*—that is, the contrast between tones in a scene. An outdoor scene in high summer has tones ranging from very bright to black. On a misty day in winter, however, the same objects may be barely distinguishable shades of grey.

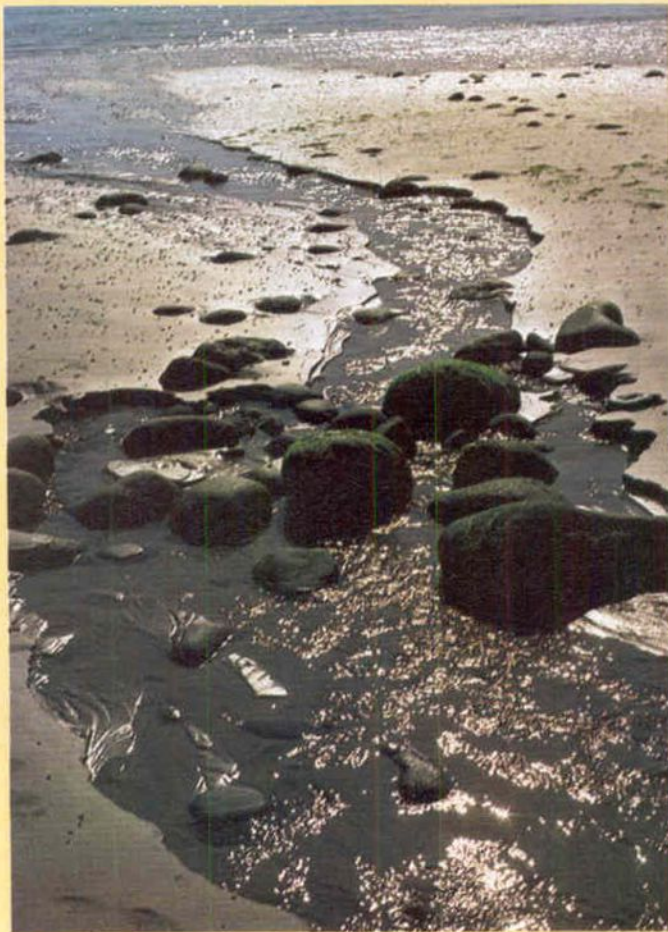
You can also see when one of your pictures is hopelessly dull and grey because of lack of contrast. You may also get the occasional picture which is so contrasty that it can be labelled 'soot and white-wash'. A photograph on a misty day can easily become an overall grey with all the subtle tones of the subject lost. A contrasty scene can also come out with inky black shadows and bald white highlights. By understanding how contrast works, you can avoid these extremes.

If you send your colour films away for processing and printing you have to accept the image contrasts that the laboratory thinks are right. With black and white film which you develop and print yourself contrast is very much more under your control, if you know how to handle it.

Eyes work differently from film: they can see a very big range of brightnesses, picking out details in the brightest highlights and the deepest shadows. We expect to see such details in photographs, but there are difficulties. Film is more restricted than the eyes as to the range of tones it can deal with, and some tones are always lost. And even if it were possible to make a perfect negative of the most contrasty subjects a paper print can only show a limited range of brightnesses—about 100 to 1 at most.

A colour slide film is a little

Soft and mellow *This is a scene with little contrast of its own, which often happens in autumn and winter shots especially on a cloudy day*



Harsh highlighting *A subject with very high contrast, very difficult to photograph successfully without losing shadow detail*

better in some respects. It can show a much higher range of brightnesses than a print—up to about 1000 to 1—but it still has its limitations. A subject such as a brightly lit beach, with sunlight reflected off wet sand and a dark foreground, has a brightness range of up to 8000 to 1 between the highlights and the shadows. A photograph can record only part of this range, but one normally ignores detail in the highlights and shadows in favour of the middle range.

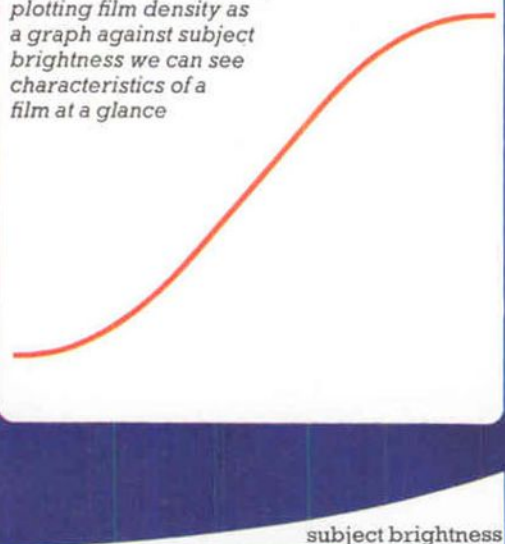
Oddly enough, a colour slide that exactly matched the contrast of the scene would look dull and lifeless. We prefer to see the contrast between objects made more apparent than it is in reality. This worsens the problem of maintaining good shadow and highlight detail. A good slide always has greater contrast than the subject it shows, but in the process shadows and highlights lose contrast as the middle tones gain contrast. The increase in contrast is deliberate: it helps to keep the brilliance of the colours of the subject. Loss of detail in the lightest and darkest tones passes unnoticed as long as it is not excessive and provided the middle tones look right.

Stephen Madden

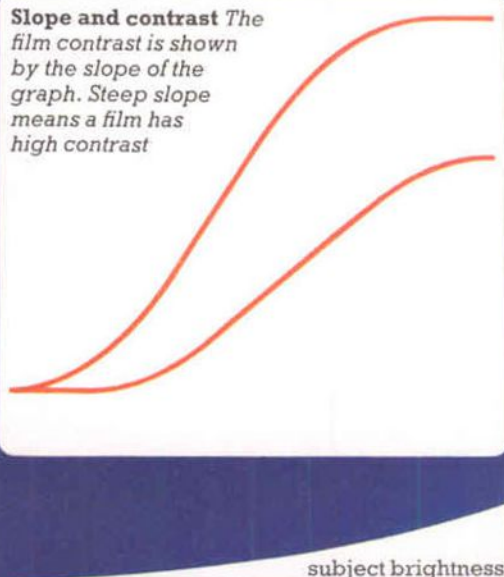


John Sims/Vision International

Characteristic curve By plotting film density as a graph against subject brightness we can see characteristics of a film at a glance



Slope and contrast The film contrast is shown by the slope of the graph. Steep slope means a film has high contrast



How to measure contrast

To understand and control the contrast of film and paper photographers use a simple graph. Since it shows the characteristics of the film for which it is drawn, it is called a *characteristic curve*. For all materials, films and papers, it has the same basic shape—a sloping straight line that flattens off at both ends. The steeper the slope, the higher the contrast. It is the straight part of the graph that is of most interest when talking about contrast.

The straight line shows that the greater the exposure, the more effect there is on the film. By plotting a characteristic curve of two different films, one of high and one of low contrast, it is easy to see the difference (fig. 2). The slope of the graph drawn for the high contrast film is much steeper than that of the film of lower contrast. Both curves start at the same point, but film A gets much denser than film B for the same increase in exposure.

Film speed and contrast

The contrast of a film is directly related to the film speed. Fast films have a low contrast. Very slow black and white film, for example, is suitable only for special applications, such as document copying, where extreme contrast is demanded. In the middle of the film speed

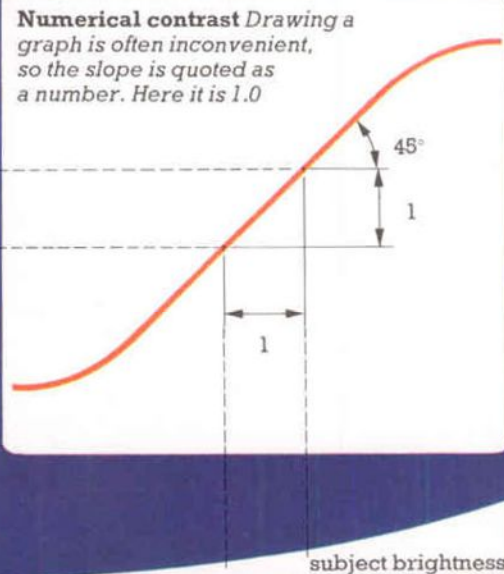
range—from 50 to 400 ASA (ISO)—film manufacturers aim to produce a range of different films which give a choice of speeds while maintaining approximately the same level of contrast.

Film contrast is affected not only by the film speed, but also by development. As development increases, so does contrast. This can be used to tailor the film contrast to the tonal range of the subject. In the case of colour negative film, any attempts to alter the development run into trouble, as the whole development and printing procedure is arranged to give average contrast. If the range of tones falls outside the recording ability of the film, the resulting print will have bald white highlights and inky black shadows, with the colours probably distorted as well.

Contrast as a number

Because contrast is such an important characteristic of film, and it is inconvenient to have to draw graphs all the time, it is often described by referring to the slope of the characteristic curve. When twice as much exposure produces exactly twice as much effect on the film, the film has a contrast of 1, and with the correct choice of scales the characteristic curve has a slope of 45°. If the exposure has a greater effect, the result

Numerical contrast Drawing a graph is often inconvenient, so the slope is quoted as a number. Here it is 1.0



is more contrast, and the numerical value of the contrast will be higher too. The numerical value of contrast is sometimes referred to by the Greek letter gamma. Most b & w films have a gamma of 0.5 to 0.8.

If a film has a contrast of 1, the tones of the subject will be recorded on the film with no increase in contrast. This is sometimes very important. When slides are being

copied, for example, the copy should ideally be identical to the original. In practice this is rarely the case, and contrast is usually increased each time a picture is copied.

Lith film has the highest contrast of any photographic material. It is made especially for copying diagrams and other images where the only subject tones are pure black and white and it cannot be used for normal photography.

Choosing colour negative film

If you want colour prints of your pictures, negative film is the easiest and cheapest way of getting them. Some films produce better results than others, however



The film used by the vast majority of amateur photographers is colour negative film, which produces prints. It is not difficult to see why. The film can be bought and processed anywhere in the world; the prints can be handed round groups of friends and family, and they do not need special viewing conditions to look at them. This makes negative film the first choice of people who want pictures of their family or holiday to carry round in a wallet or bag.

There is also a financial incentive. Open any glossy magazine, and a bundle of 'free film' envelopes will often drop out, offering cheap prints and a free film.

Colour negative films have been widely adopted for good reason. They are very tolerant of abuse: it is possible to expose them in a great variety of different conditions, and still get reasonable results. Therefore, colour negative

films are ideal for simple cameras that have no exposure control devices, and which demand a film that is capable of recording a wide range of lighting intensities.

The tolerance of colour negative films is not limited to the intensity of the light. It is possible to take photographs in light which varies greatly in colour too. Daylight is very rich in blue light, whereas conventional light bulbs are much redder in colour. Colour negative film can cope moderately well with a large range of light sources, and though colour quality would sometimes be improved by using a colour correction filter over the camera lens, negatives taken on the same roll both indoors and outdoors can generally produce satisfactory prints.

The easy-going nature of colour negative films can partly be attributed to the way in which the prints are produced

Negative and print Colour negatives are orange overall, and reproduce colours as their opposites—green appears as red

from them. The colour negative is only an intermediate which is used to produce a print, and is not itself the final picture. It is therefore possible in the course of printing to compensate for a small degree of underexposure, and quite a surprising amount of overexposure.

In a similar way, by making changes to the colour filters in the enlarger during printing, the overall yellow colour that would usually result from using colour negative film in artificial light can be removed.

Types of colour negative film

Colour negative films are developed by one of two processes. Of these two, by far the most widespread is Kodak C41.

All films which are processed in these chemicals have basically similar characteristics, and the differences between brands are less pronounced than those between fast and slow films.

Colour negative films can be divided into two main groups—those of medium sensitivity, which have speeds from 80 to 100 ASA (ISO), and fast films, all of which are rated at 400 ASA. In general terms, the slower films give finer grain and definition, and though the 400 ASA films are perfectly suitable for snapshots, they may prove to be unacceptable if the results are blown up larger than about 12 × 18 cm.

Processing

Since film development is so rigidly standardized, there is little to choose between one laboratory and another—they all run film through the same chemicals for the same times, and at the same temperature. Furthermore, any minor differences are usually concealed by the colour printing. The manufacturers of the films often offer their own processing service, but it is doubtful whether these services offer any significant advantages.

It is possible to process colour negative films at home, but the chemicals supplied by Kodak are perhaps not ideal: the procedure adopted by commercial laboratories requires tight temperature control—to within $\pm 0.25^\circ\text{C}$ —and some of the process times are as short as 3½ minutes. Consequently it is very difficult to control the process with sufficient precision without special facilities. However, a number of manufacturers offer kits of chemicals which can be used at lower temperatures, and at a more leisurely pace. For the amateur photographer, these provide more consistent, reliable results.

Printing

Colour printing tends to be more variable from laboratory to laboratory than colour developing, and to get the best out of colour negative films it is necessary to find a laboratory that produces a reliable, consistent service. Unfortunately, the only way to do this is generally by trial and error or personal recommendation. A general guide to quality is the traditional idea that you get what you pay for—it is not reasonable to expect the lab that does cut price developing and printing to produce the same quality pictures as one that charges 20 times the price for top quality results. It is quite straightforward to make your own colour prints from negatives, however, and many companies supply kits of chemicals to do this.

What to look for

When choosing a colour film, the most obvious features to look for are colour quality and freedom from grain. Colour quality is the most difficult to evaluate, partly because it is very subjective, and partly because it is so profoundly affected by the standard of colour print-

ing that the lab offers. When evaluating colour quality, look particularly at skin tones and white parts of the picture. These areas are the first to pick up any colour cast. Bright colours should also be clean and well saturated, and not muddy or washed out.

There is a great difference in grain between fast and slow colour negative films, and this will be quite clear at even moderate degrees of enlargement.

Besides the actual colour produced by negative films, there are a number of other points to watch for: look at the expiry date on the packet, and think about how long you are likely to keep the film in the camera. Short-dated film usually indicates that the dealer has had it on his shelves for a long time and, if you take pictures fairly infrequently, it is a good idea to check that you have a generous amount of leeway as regards the 'process-by' date which is printed on every box of film.

The exposure latitude of colour negative films is considerable, but there are variations from one brand to another. If you own a simple camera, then it will be important to choose a colour negative film that has a good tolerance to overexposure, to which these cameras are prone. When using more sophisticated cameras in conjunction with an exposure meter, exposure latitude will influence choice of film to a lesser extent, though it is still useful to have room for error.

The choice

Kodacolor II Speed 100ASA. Probably the best known of all colour negative films, Kodacolor II produces very sharp,

fine grain negatives with excellent colour saturation. It is rather contrasty compared with some of the other films and the green objects in the picture sometimes tend to go rather blue.

Kodacolor II has a latitude of about two stops to overexposure and about one stop to underexposure. Like most of the other films it is available in all popular sizes from 110 cartridge to 120 roll film; 35 mm cassettes are available in 12, 24 and 36 exposure lengths. A good all-round choice for general purpose colour negative photography.

Vericolor II Type S Speed 100ASA. This is Kodak's professional colour negative film and is sold as being balanced for daylight whereas most others are said to be 'universal'. Vericolor II handles soft pastel colours much better than Kodacolor II without sacrificing the saturation in brighter colours. In other words the colours are much more natural-looking than those produced by most other films which tend to give a rather larger-than-life result.

Vericolor II has grain a little finer than Kodacolor II and sharpness that is a little better. Latitude is generally less—it will handle about one stop of overexposure and half a stop of underexposure without losing too much quality.

Sakuracolor II Speed 100ASA. This Japanese film is a comparative newcomer to the market and gives good results. The colour balance is rather warmer than that of Kodacolor II; the greens are more natural. Contrast is about the same or a little lower than Kodacolor II but it is still harsher than Vericolor II.

Sharpness and grain are not quite as good, but colour saturation is high—perhaps a little too much for lifelike results.

Fujicolor II Speed 100ASA. Another Japanese film, Fujicolor has been around for much longer than the Sakura product and is generally better known. It has perhaps the closest similarity to Kodacolor II, but the colour saturation is rather softer, as is the gradation.

Grain is a little coarser than the other films, but sharpness is excellent, latitude, too, is well up to that offered by Kodacolor II.

As with Kodacolor II, greens tend to be a touch on the blue side, and there is sometimes a tendency towards slight magenta in the highlights. Fujicolor II remains an excellent all-round film at a slightly lower price than the Kodak product.

High Speed films

Kodacolor 400 Speed 400ASA. Kodak introduced their own high speed film in 1977. It is much more grainy than the slow films and the sharpness is not as good; it falls down badly when trying to resolve the detail. Colour saturation is quite good and the balance is natural.

Because of the graininess of this film, it is not really suitable for use when enlargements greater than 12 × 18 cms are required from 35 mm film.

Colour terms

When talking about colour films it is easy to become confused by the proliferation of jargon. Although a lot of the terminology is used fairly loosely, these definitions can be used as a general guide.

Contrast This word is used only to describe the contrast between dark and light areas of the picture, and is not used to refer to colours that contrast with each other. The use of the word is therefore the same as in its b & w context.

Latitude This refers to the tolerance that a film has to over or underexposure. If, for example, it will produce an acceptable picture within a wide range of exposures, it is said to have considerable latitude.

Gradation Like contrast, this term refers to the tonal, rather than colour qualities of the picture. A picture could be said to have 'good gradation' if similar tones in the picture could be easily distinguished from each other.

Saturation If a bright, rich colour in the subject of a picture appears in the print or transparency with similar bright, clean colours, rather than muddy washed-out ones, then the film would be said to have well saturated colour.

Colour cast A picture should not show a dominance of one colour over all others. If it does, and looks as if it has been dyed in a vat of that colour, it is said to exhibit a colour cast.

This film responded badly to underexposure but latitude was about $2\frac{1}{2}$ stops on the overexposure side. The contrast is a bit higher than Kodacolor II.

Sakuracolor II Speed 400ASA. This comes close to the colour performance of its slower counterpart. It has a slightly warm colour balance with good greens and reds; yellows are particularly clear. Contrast is about the same as that of Kodacolor 400 but grain and sharpness are better.

The film's latitude is about two to two and a half stops as far as overexposure is concerned, and no more than one stop to underexposure.

Agfacolor CNS 400 Speed 400ASA. Of the fast films, this has been regarded by some as the best by quite a long way.

Agfa films have always been noted for their natural colour balance, especially to outdoor subjects, and this film is no exception.

The contrast of Agfacolor 400 is a little higher than that of the other fast films, but it is not at all harsh. The major advantage of this film is its extremely fine grain for a colour film of this speed. Unless you look in areas of uniform tone and colour, it is very difficult to detect the grain at all, even in fairly large prints. You can make 24×36 cm enlargements from 35 mm film with very little trouble.

This film's colour saturation is good but not overdone and sharpness is excellent. Its latitude is roughly two stops to overexposure and rather less than one stop to underexposure.

Film Test In order to provide a comparison between a selection of the available colour negative films, we tested seven of the most popular ones. All seven were exposed under identical conditions, as recommended by the manufacturer. They were then given the same C41 processing, and printed. The printing differed for each film, as each make required different filtration to produce the best colour. Every negative was printed twice: once, using most of the negative area, and then again, enlarged $20\times$ to show grain size and sharpness. Though the reproduction process has made the differences between the films less marked, it is quite clear that the 400 ASA films give distinctly inferior quality



Kodacolor II



**Vericolor II
Types**



Sakuracolor II





Fujicolor II



Kodacolor 400



Sakuracolor 400



Agfacolor CNS 400



Creative approach

City at night

The character of a city changes totally at night, with rich rewards for the photographer particularly at dusk. Try to avoid the more obvious shots, however, looking for unusual angles and abstracts instead



John Sims/Vision International



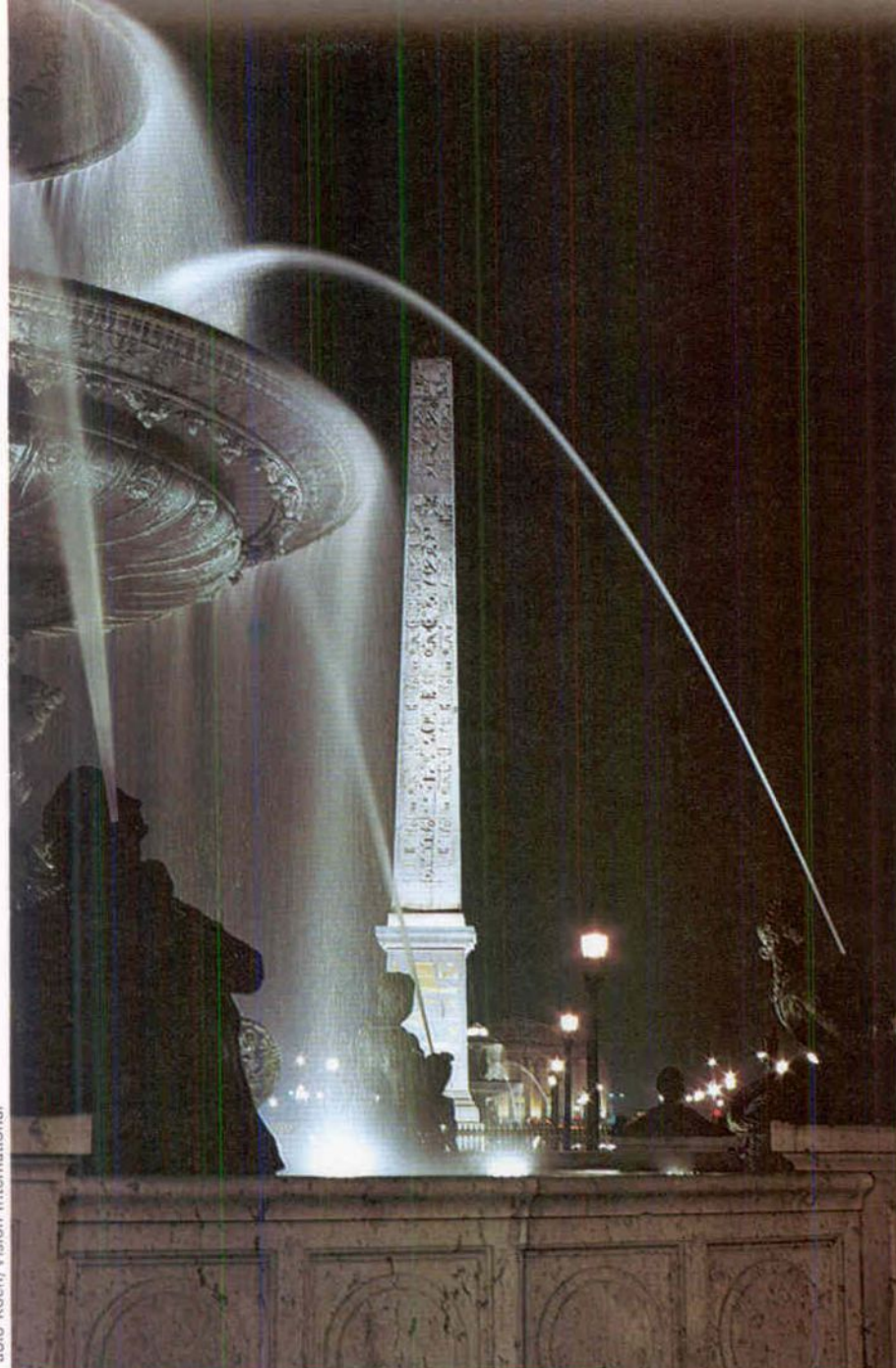
B. Bright/Photo Library International

Night is a time when most photographers put down their cameras and go out on the town to enjoy themselves or stay at home and watch television. Few realize the potential the night holds for good pictures—many dismiss it simply as an excuse for taking pretty but hackneyed shots of coloured neon lights or flood-lit fountains. Yet night time in the city offers a wealth of opportunity.

Unlike the countryside, night in the city is rarely completely dark and there is usually enough light to take pictures providing you give sufficiently long exposures. The variety of light sources

Car Look for those reflections. Objects not worth a second glance by day can be transformed at night

Wharf Dockland areas can make really dramatic pictures. There is just enough light in the sky to make this shot work



stand out brilliantly against the darkness of surrounding areas. It is simply the pretty colours of the bright lights that make these pictures and it is worth remembering this when framing up your shot since large blank areas can be quite boring.

If the background is completely black, the final picture is rather abstract since there is no scenery to tie the lights together. In this case, you must give careful thought to composition and try to imagine the scene in the frame as an abstract pattern of coloured highlights in the final picture. No matter how attractive the lights were in reality, they can look rather uninteresting on film unless the shot is well composed. In this respect, it is worth remembering that a few large areas of a single colour or a few complementary colours generally tend to look better than many small areas of competing colours.

Alternatively, rather than an abstract shot, you may want to make more of a cityscape by including more of the scene in the frame. A longer exposure will be needed to bring out detail in the darker areas but you may need to include extra highlights to enliven these dull areas. The light from passing cars or shop windows helps, but perhaps more important are reflections. Windows, cars and any shiny surface will reflect the neon lights and enliven the areas of shadow in your picture.

A rainy evening is a particularly good time to take pictures like these because the scene is filled with numerous wet surfaces, each reflecting the neon lights, creating a myriad of brightly coloured highlights to complement the direct light

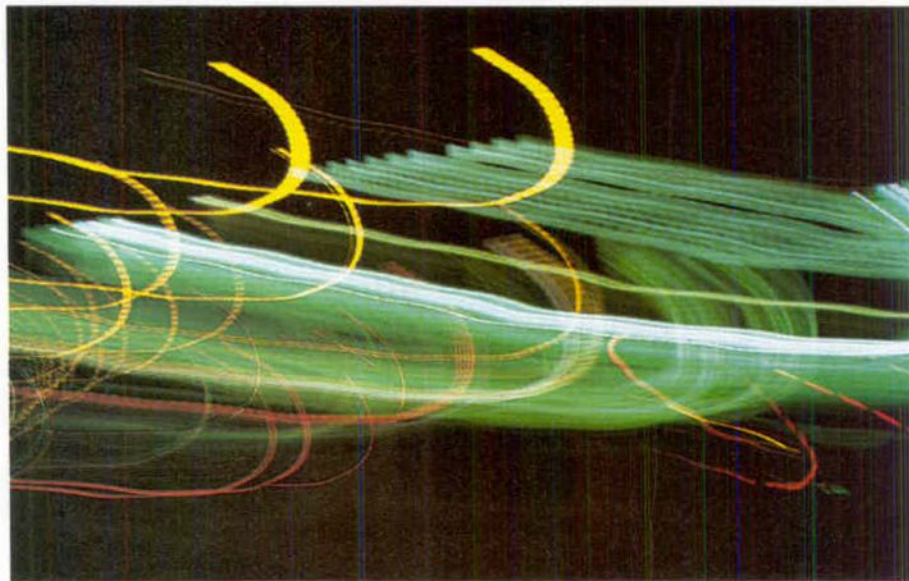
Fountain A slow shutter speed has turned water into a stream of light. The composition is improved by placing the fountain off centre

Lights With a long exposure abstract effects can be created by pointing the camera at light sources and carefully moving it while the shutter is open

is immense—perhaps more varied even than daytime—and this is what makes the city at night such an exciting location for the photographer. The key to night time photography is to seek out the light that is available and exploit it to the full, whether it is the bright flash of the neon light or moonlight reflected in puddles.

In fact the diversity of illumination encourages many photographers to concentrate simply on the light source as a subject in its own right and this can produce some dramatic results.

Pictures of neon lights and holiday resort illuminations are the most popular examples. Very few photographers about in London or New York after dark can resist the temptation to take pictures of the spectacular advertising displays in Piccadilly Circus and Times Square. If you give the right exposure—some typical exposures are given in the panel—the myriad of coloured lights will



from the advertisements. Indeed, it is often worth excluding the lights altogether and concentrating on the reflections alone. This can produce far more interesting and varied shots than the standard head-on shots of the neon lights or festive decorations.

One point to bear in mind when photographing light displays is that each display can be animated or flash on and off at different intervals to the rest. So when you press the shutter, some of the animations may be at uninteresting stages and some displays may be off altogether. Either way, the result may be less spectacular than the moving lights in the original scene.

But there are many other lights in the city to explore. Signs for theatres, clubs and shops can be equally bright and colourful but make smaller, more manageable, subjects. Because such signs are less overpowering, they need not be the only features in the picture. They can provide just the focal point or a small highlight to enliven a general view of the street.

Fairground lights, shop windows and even street lights also have photogenic potential. A pattern of streetlights disappearing into the distance or meeting at some distant focal point can make a pleasing landscape, again particularly benefiting from reflections from the surface of the road.

Different types of streetlight give a different colour cast to the scene they illuminate when recorded on film. This can sometimes be a nuisance because it

Freeway, Los Angeles Car lights are a classic long exposure subject. Stop the camera down to prevent overexposure on fast film

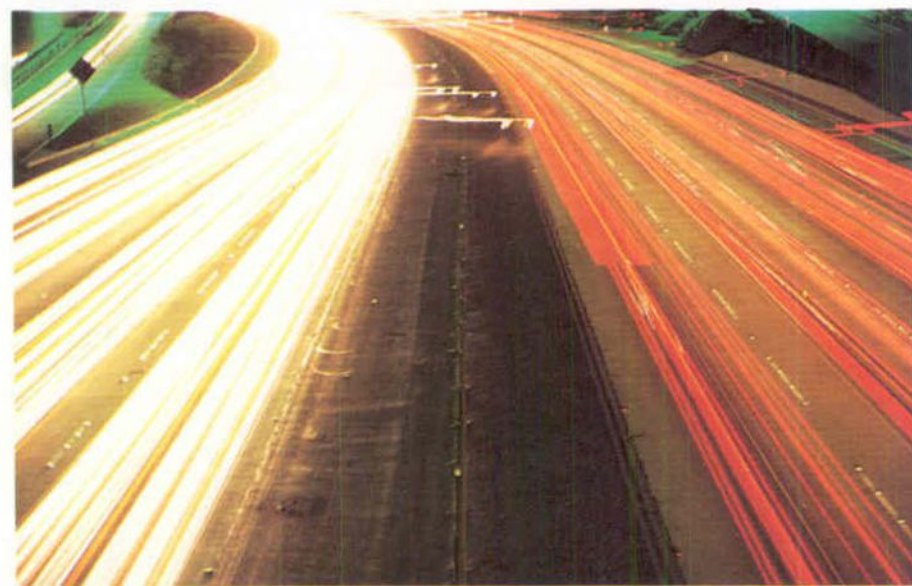
Puddles Reflections on a wet night increase the amount of illumination, filling in what would otherwise be dark areas with big splashes of colour



Big Ben Dawn or dusk help to fill in the background with a deep, rich glow, particularly in winter. This shot is enhanced by the backlighting

makes it impossible to make scenes look natural, but you may be able to use the different colour renditions of the various light sources creatively. Fluorescent light, for instance, gives a rather dullish green cast to daylight colour film and a small splash of yellow or red light such as an illuminated shop sign may look very effective in a scene generally illuminated by fluorescent light. Try to avoid including people in such shots, though—green people rarely look pleasant.

On the other hand, tungsten light—the yellowish white light from domestic light bulbs—gives a slightly orange cast when photographed using daylight slide film. Although this too is unnatural, it can nonetheless give rather pleasing results. A hot summer's night in the city, for



Earl Young/Colorific



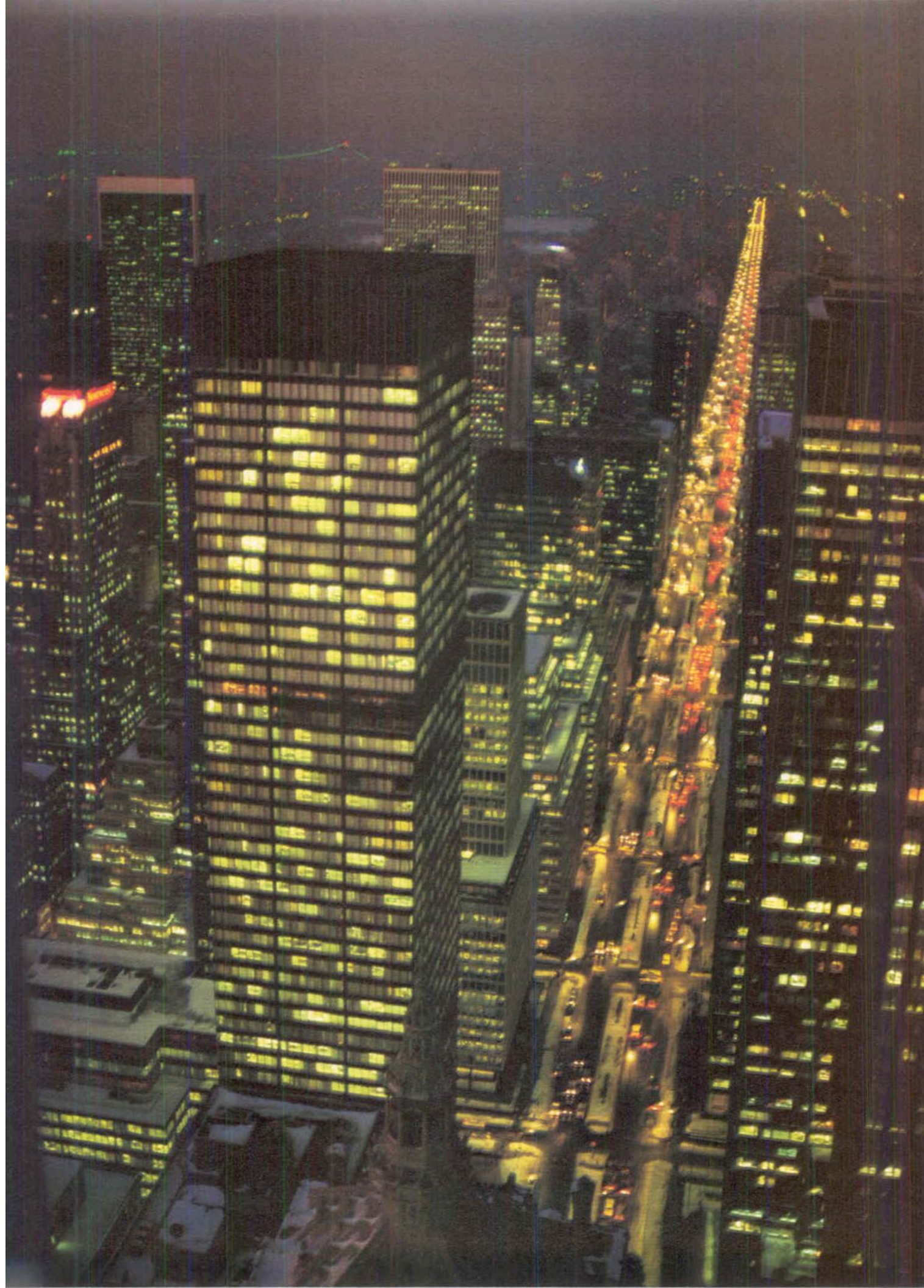
instance, will look just that much warmer if you use a daylight slide film to give this orange cast. This effect can be equally useful in winter because lighted house windows look warm and cosy.

If any of these light sources are moving, or, alternatively, the camera is moving, the shutter can be held open for a long time to create stunning special effects. The classic example is moving car lights. If the shutter is held open long enough, many cars will have moved right across the frame and out the far side during the course of the exposure. Their progress is recorded simply as a pair of bright streaks created by the cars' lights as they move through the frame. Cars moving away from the camera will leave a pair of thin red ribbons; cars moving towards you leave a pair of white streaks.

For this sort of shot the street must not

Along the avenue As dusk falls on a snow covered New York City, the lights along Park Avenue make it appear to be reaching right up into the sky

Tim Cagan/Susan Griggs Agency



Adam Woolfitt/Susan Griggs Agency



Coming home Look away from the bright lights if you want to capture beautiful moody shots like this, photographed in Nelson and Colne

be too busy, or these traces will merge into an amorphous mass, but if just half a dozen or so pass during the course of the exposure, the result will be a series of distinct traces creating an attractive pattern. It is also better to have a fairly high viewpoint to show the pattern clearly. And try to avoid headlights since they tend to wash out. You could include a bend in the road so that the traces are not dead straight.

Lights from a moving bus or train can be recorded to create equally pleasing abstracts, but a particularly spectacular result from long exposures for moving lights is produced by fireworks. With the shutter open for a long time, the camera will record not just a single firework, but a whole display on the same frame. And each firework will be shown as long, coloured fountains of light, recording the passage of each spark through the air. In this way, a firework display, particularly over water, can look far more impressive than ever it did in reality.

Long exposure can be used to create a whole variety of other spectacular special effects. People crossing a square can appear as ghostly streaks, the rides at the fair can change into glowing catherine wheels and once you start moving the camera around during exposures you can begin to create weird abstract effects. With special attachments to your camera, the city at night is susceptible to a tremendous range of spectacular effects and these will be explored in a later article.

One of the beauties of night photography is that scenes that seem mundane during the day take on a new interest at night. Buildings that look dull and uninspiring can become glittering palaces under the influences of floodlight and simple fountains can become glowing streams of light.

Because all the shadow details dis-

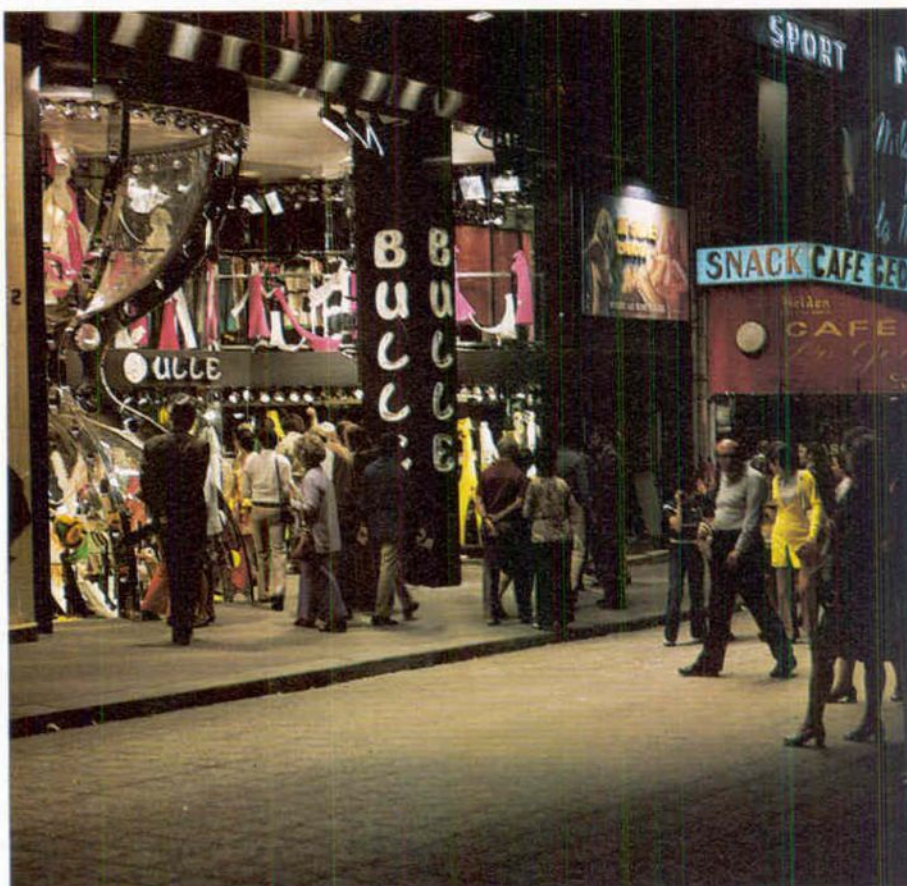
Candid camera Fast film and wide apertures are useful when taking pictures of people in streets. This was taken on artificial light film

EXISTING LIGHT PICTURES

A guide for fast films rated at 400ASA (ISO) – such as TRI-X, HP5, Kodacolor 400 and Ektachrome 400.

Shop windows lit with bright fluorescent light at night	1/60 at f/4
Christmas or festive lighting at night	1/15 at f/2
Brightly lit street scenes at night	1/60 at f/2.8
Neon signs at night	1/125 at f/4
Floodlit buildings, trees and fountains at dusk	1/30 at f/2
Floodlit buildings, trees and fountains at night	1/15 at f/2
Poorly lit street scenes at dusk or dawn	1/8 to 1/4 at f/2
Poorly lit street scenes at night	1/2 to 1 sec at f/2

Even if you are using a light reading of part or all of your subject, it is still worth bracketing one or two stops or speeds for the best overall picture effect.



D. Pittius/Zefa

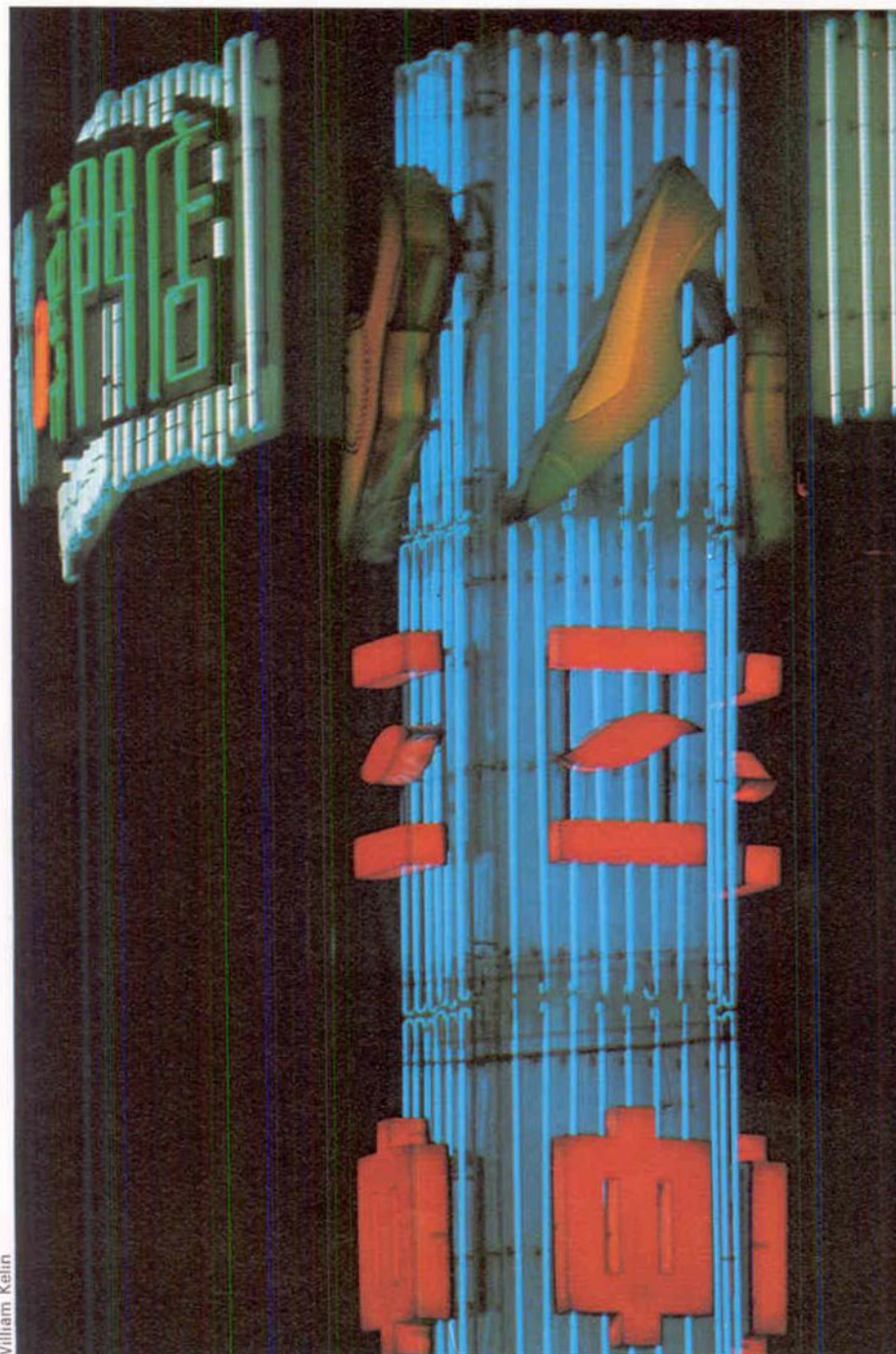
introduce a sense of drama to candid and landscapes. Dramatic pools of light in dark shadowy streets can make the final photograph disturbing and you can use this to convey the tension and unease that pervade some of the tougher areas of many cities. With wet bricks and dark alleys, a single bright highlight can give a very threatening photograph—particularly in black and white.

In contrast, glowing windows and bright shop displays can make a very pretty shot in a more attractive area of the city. This sort of shot is particularly effective in a winter dusk. The long twi-

Floodlighting A wide angle lens was used to help emphasize the weird effect created by floodlighting this tree. Look for similar shots with buildings



John Sims/Vision International



William Klein



Trouilleux/Atlas Photo

Bicycle The green cast of the fluorescent light from the doorway adds a nice subdued tone to the picture, tying in with the fallen bike

Abstracts When colourful neon lights abound, try closing in on a few small areas to produce simple abstracts. Bracket the exposures for good results

light leaves a trace of light in the sky, which can come across as a rich dark glow that enhances the cosiness of the scene. If the exposure is long enough, there may even be enough light left to show up a little detail in the brickwork or to retain a few interesting details in the shadow.

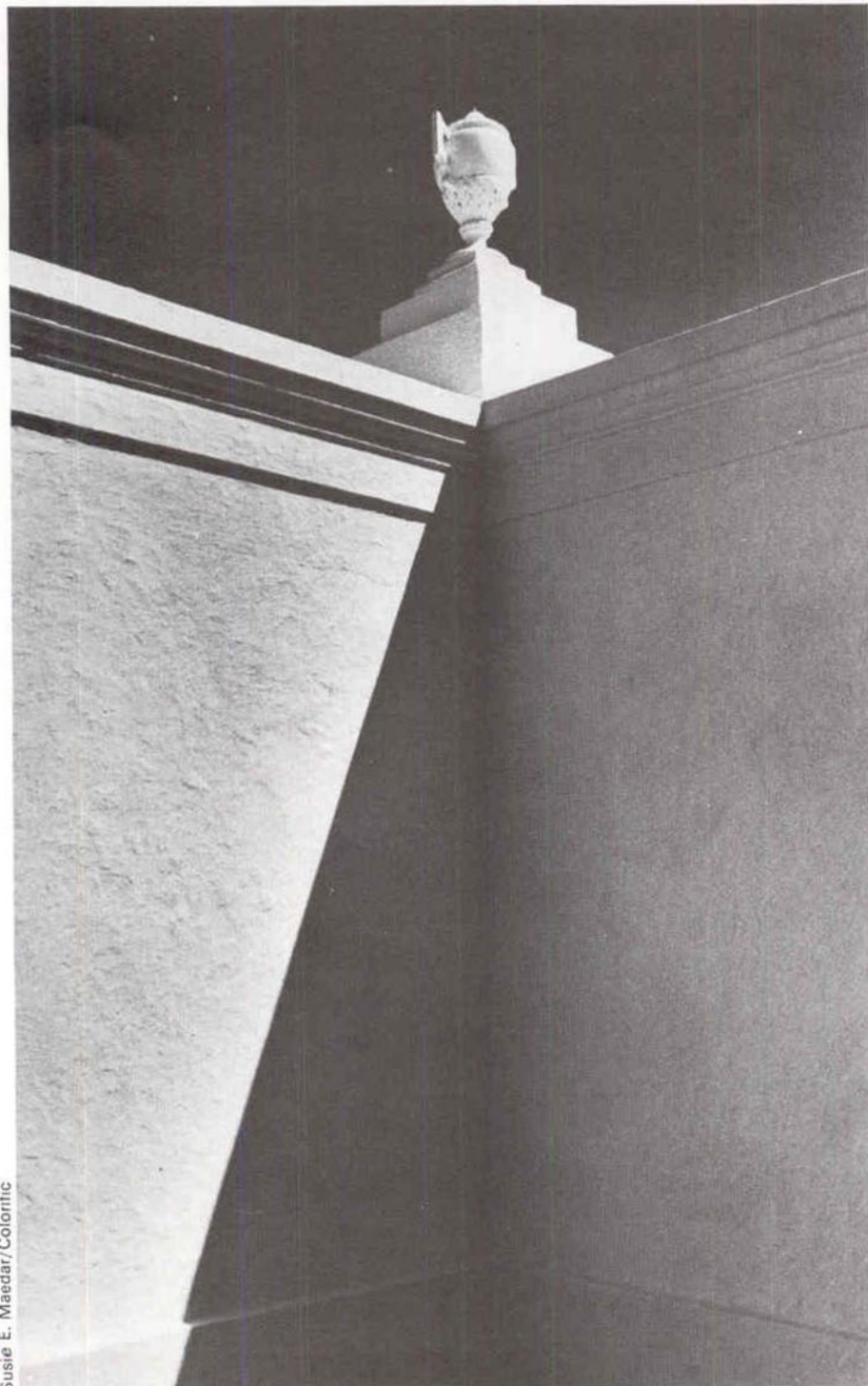
Timing in night photography is very important. Dusk is certainly a good time for attractive pictures of the city because there are plenty of office lights on to enliven the scene. Shots near dawn, on the other hand, with most lights off and few people about, can be still and atmospheric. A small lone figure on his way back from a late party, or on his way to work, can add a touch of poignancy to such misty early morning shots.



Darkroom

Making enlargements

Printing your own black and white photographs is both creative and great fun. To get good results first time, though, you should start the right way



If taking pictures is fun, making pictures is twice the fun. And although darkroom work embraces a very wide range of topics and techniques, the basic skills are easily mastered so the enjoyment of making prints and enlargements is quickly experienced.

In a black and white (b & w) negative the original subject is rendered in shades of black, white and grey in approximately the reverse of their original tonal values. Light parts of the subject appear dark in the negative while dark parts appear light. This negative image has to be turned into a positive one before it can show a readily comprehensible reproduction of the original scene.

This is done easily enough by *printing* the negative on a material that, like the original film, is sensitive to the action of light. The lightest parts of the negative appear darkest in the print. As in a camera, exposure is controlled by adjusting the type and quantity of the exposing light, and the time this is allowed to act.

Equipment requirements

It may seem surprising that, although great care has to be taken to make sure that your chosen work place is properly dark, almost every form of b & w work may be done under fairly brightly lit conditions—but with lighting of a rather special nature.

Most b & w printing papers, and some film types used in darkroom work, are insensitive to light of certain specific wavelengths or colours. In other words, they may be handled in (and be exposed to) light of a certain colour without being affected in any way. Such lighting is

Top class print quality *To obtain a really good print, you must start with a good negative—but then it is down to straightforward enlarging technique*

Checklist

- Enlarger with lens
- Darkroom safelight
- Masking frame
- Set of three dishes
- Print forceps/rubber gloves
- Scissors
- Two towels
- Waste bin/tray
- Photographic thermometer
- A large water bath or special dishwarmer will be necessary if room temperature is much different from 20°C
- Print developer, fixer, stop bath
- Printing paper
- Measures and storage bottles
- Watch or timer with seconds hand

Print exposure



1 Arrange a 'dry' work area which has room enough for the enlarger. A towel can be kept nearby—use this to keep your hands dry during enlarging stages



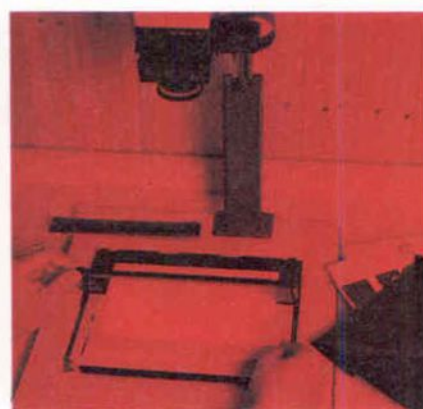
2 Dust is a real problem in temporary darkrooms—especially if you have to black out using blanket material. Dust your negatives carefully



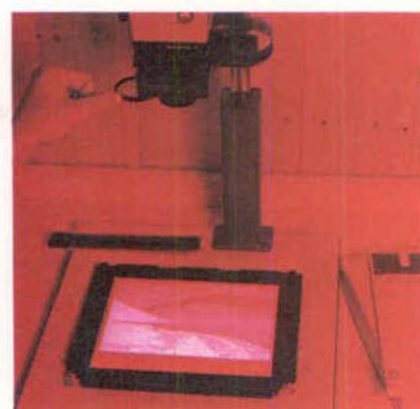
3 Turn on the safelight and switch off other lighting. Allow your eyes to adapt, and check for light leaks. Turn on the enlarger and adjust the image



4 When you are happy with the picture's composition, check the focus and close down the aperture by two stops to improve the image quality



5 Either swing the red filter beneath the lens or switch off the enlarger. Then place a sheet of printing paper on the enlarging easel



6 Make a trial exposure of 10 seconds by either swinging the red filter aside, if the enlarger is vibration-free, or switching on the enlarger lamp

termed *safe* and the lamp used to provide it is usually referred to as a *safelight*. Various types are available.

For most general uses, including ordinary b & w printing, safelights of red, orange or yellow colouring are satisfactory. Normally only one safelight is necessary for a small, temporary darkroom. Various inexpensive ones are available. A safelight must be used a safe distance from sensitive materials, so make sure that you follow the manufacturer's recommendation.

The main item of equipment—and indeed the most costly darkroom item you are likely to buy—is an *enlarger*, a type of projector used to magnify the small-sized 35 mm negative image to more useful print dimensions. This is why printing is more usually referred to as *enlarging*.

An enlarger is a potentially complicated device, so the business of choosing one will be dealt with in a separate article. Here it is enough to say that it is a matter of buying the very best and the most versatile you can afford. To start with, a good quality 35 mm enlarger

topic

Choosing your printing paper

Printing paper choice depends on several factors, the most important of which is its 'contrast grade'. Although this topic is discussed in more detail in a subsequent section, a brief explanation at this stage is a help when it comes to choosing from what seems to be a very wide selection of printing papers.

A negative is capable of recording a comparatively wide range of tones, not all of which can possibly be accepted by the fairly limited range of tones which can be handled by printing paper. To get the most faithful reproduction of the original subject you have to match the printing paper's capabilities as accurately as possible with the negative. Some sacrifices have to be made, but to lessen the effects of these (and to increase the accuracy of the reproduction) printing paper is available in several different contrast grades. These range from a 'soft' grade (which describes paper of low contrast), through 'normal' (normal contrast) and on to

'hard' (high contrast) grades, although it is more precise to speak in terms of the contrast grade number. These numbers vary from manufacturer to manufacturer.

Low number grades signify soft paper, which is suitable for printing negatives of very high contrast. Medium range numbers (typically grade 2 or grade 3) signify papers which you use for printing normal negatives of medium contrast. High grade numbers stand for hard paper suitable for printing negatives of very low contrast.

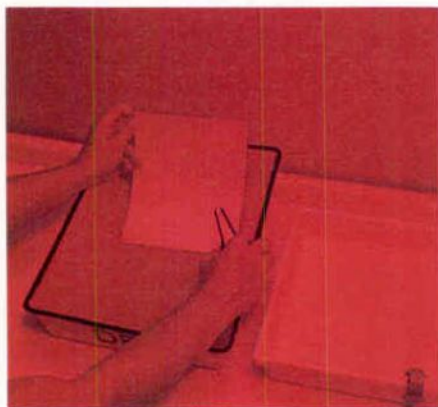
To start with, there is no real point in buying anything apart from a packet of normal grade paper—the middle of the road choice.

Many of the papers now available are not, in fact, 'papers' in the conventional sense of the word but consist instead of a polyethylene laminated paper base on which is coated a light-sensitive emulsion layer. They are described variously as 'plastic-based' or 'resin coated' and abbreviated PE or RC. Their characteristics make them particularly suitable for first-time print makers.

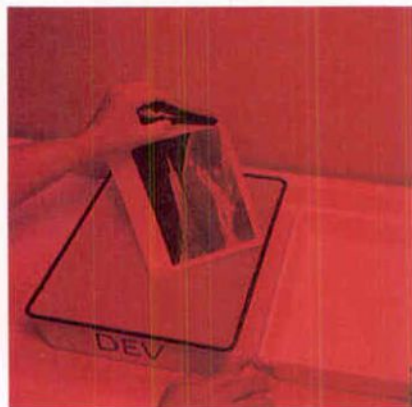
Print processing



1 Arrange a 'wet' work area that is separate from the 'dry' area. Mix suitable quantities of developer, stop bath and fixer at the correct temperature



2 When you have exposed the print, move to the wet area and immerse the print in the developer. Make sure that the whole print is soaked evenly



3 Drain the print at the end of the development time—one minute for resin-coated papers, longer for the old-type fibre-based papers



4 Transfer the print to the stop bath and agitate it continuously for a few seconds. If you use a water bath instead, rinse the print for a longer period



5 Now put the print in the fixer and keep agitating it for the first half minute, regardless of the type of fixer you are using



6 At the end of the fixing period—up to ten minutes with standard fixers, much less with active rapid types—drain off the print ready for washing

should be perfectly sufficient. Spend any extra money on a top-quality *enlarging lens* as, ultimately, it is this which influences the actual quality of your enlargements.

There is virtually no end to the list of equipment one could usefully employ in connection with the various darkroom techniques. Little of it is absolutely essential but the items on the accompanying checklist should be considered as highly recommended.

A set of at least three dishes is needed for the processing stages of b & w printing paper. The dishes should be large enough to take the largest print size you contemplate using normally. A good basic size of dish is one that comfortably accepts 20 x 25 cm (the popular 'ten by eight')—so choose a dish that is one size larger. This makes print manipulation a little easier, so preventing the risk of scratching.

Printing operations are clearly divided

into two distinct forms of darkroom work: 'dry' operations which include handling sensitive materials and actually making enlargements and prints, and 'wet' operations which deal with all aspects of processing. It helps greatly to think of all forms of darkroom work as falling into one or other of these two categories. In fact, it is advisable to arrange the layout of the darkroom so that wet operations are kept separate from all forms of dry operation.

The actual number and type of processing stages involved in black and white printing does not differ greatly from those necessary for b & w film processing and it may be possible to use the same chemicals for both. But if you can afford to do so, buy a separate set of chemicals designed for print processing.

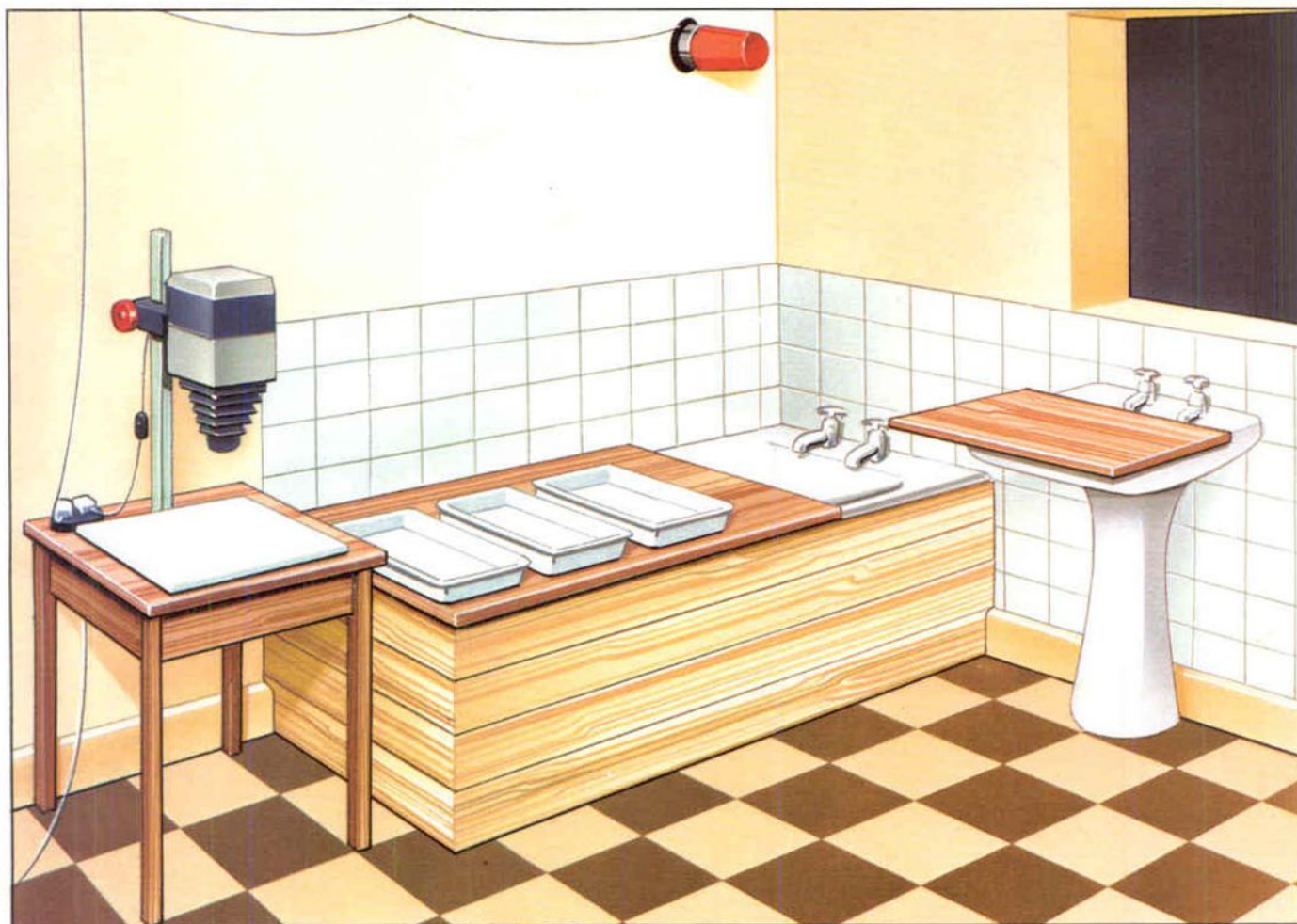
Processing stages begin by immersing the exposed print into a dish of developer. The print and solution is agitated continually for two minutes, during which time an image forms—development is monitored by inspection under suitable safelight conditions. The function of the developer is to render visible

Processing stages

	time
1 Development (using matched 'high speed' developer with RC paper) (using conventional print developer)	1 minute 2 to 2½ minutes
2 Intermediate rinse or stop bath (optional)	Up to ½ minute
3 Fixing (using rapid action type) (using conventional fixer bath)	½ to 2 minutes 2 to 10 minutes
4 Washing (RC paper; running water) (conventional papers; running water)	Up to 2 minutes At least 30 minutes*
5 Drying (RC paper; fan heating) Otherwise, all papers	Several minutes Several hours

Note: Although each print has to complete a minimum of four separate stages, this does not mean that just one print at a time is all that can be handled.

*Washing time can be substantially reduced by using a 'speed wash' agent.



Advertising Arts

Safety first If you must use the bathroom as a temporary darkroom, take particular care not to let extension leads and wires trail near wet surfaces and taps or on floors. Keep the electrics clear of trouble by providing a separate 'dry' area. No switch should be within reach of any liquid or tap. (Australian readers: d-i-y electrical connections are illegal.)

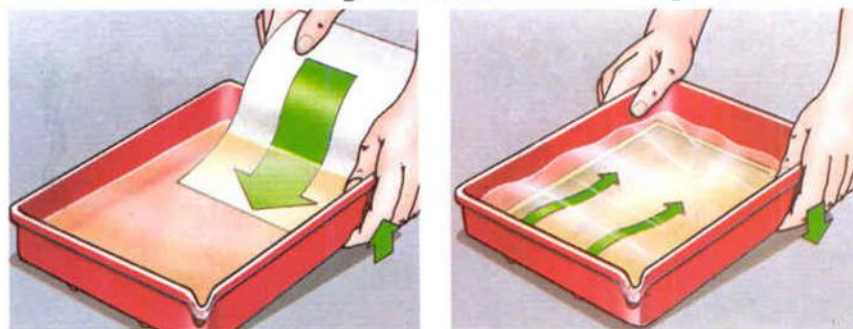
'activated' silver bromide crystals contained in the emulsion of the printing paper, the principles being very similar to the exposure and processing of film.

At the end of development, the print is drained and briefly rinsed in water or a stop bath before passing on to the fixing bath where it remains, with occasional agitation, for up to ten minutes.

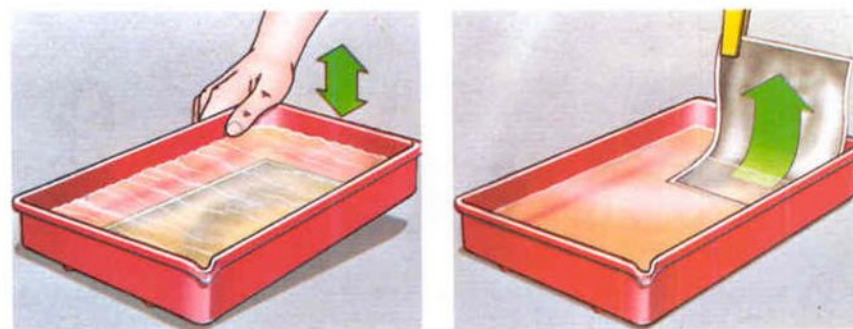
A long wash follows and, as with film, it is important not to skimp this if image permanence is required. After washing, the print can be wiped off, blotted and dried naturally. Drying can be forced using fan heaters or hot cupboards in certain instances (a treatment recommended in the case of some printing materials). Glossy-surfaced, paper-based printing materials can undergo a procedure termed *glazing* in order to obtain a really gloss finish.

The next article of the series takes a close look at how you can make an accurate test print, an important step in making top-quality enlargements with the minimum waste of time and materials.

The correct way to immerse a print



To ensure that the whole print surface is covered uniformly and quickly by the developer, raise the dish and slide the print, face upwards, into the shallow end. Immediately lower the dish so the resulting wave covers the print. Agitate the developer continuously by raising the dish corners in a random sequence



Bernard Fallon

A day on a farm

Taking a series of photographs of any one particular subject is an excellent way of training your creative eye. On a cold and wet day George Wright photographed one on a small dairy farm



George Wright

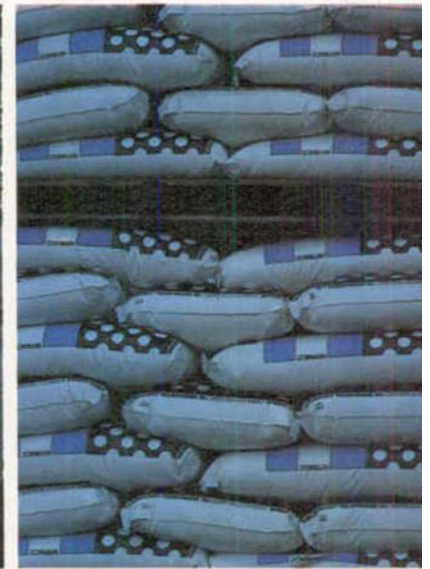
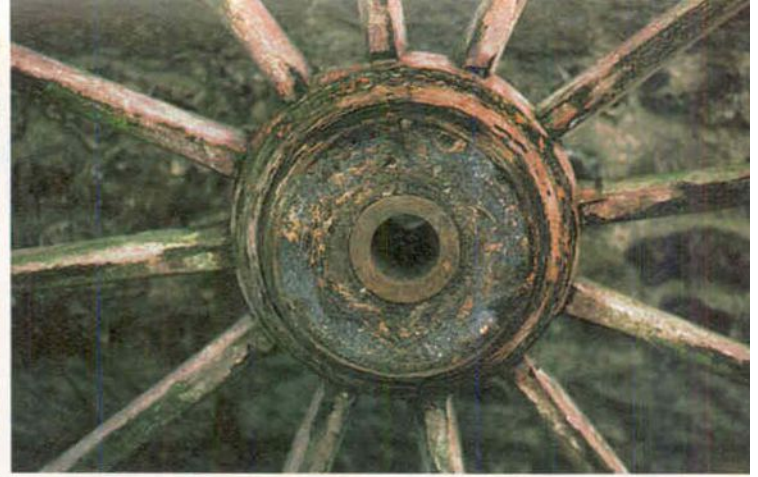
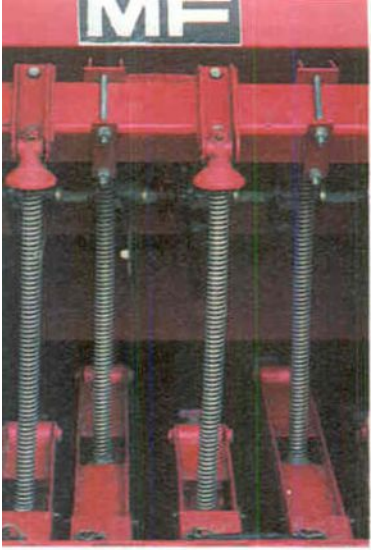


On sunny days you find plenty of people exploring the countryside with camera in hand, but a photographer is a rare sight in these areas on unpleasant days. In spite of the cold and damp weather, George Wright was more than willing to give this assignment a try, however, as he felt that it posed considerable photographic possibilities.

Without the more common photographic subjects such as young lambs, ripened crops or harvesting, George had to look harder for his material. Although there were some activities taking place, there was not enough going on to make an interesting series of photographs. To make up for this, George had to take several still life shots which had the effect of adding some variety while still capturing the atmosphere of the farm. These static shots also enabled him to add colour to the scene.

This overall lack of colour was one of

A colourful sunrise This provided a start to the series. **Flock of sheep** When the farmhands started to move the sheep, George used his 300 mm lens to pick out a group of them



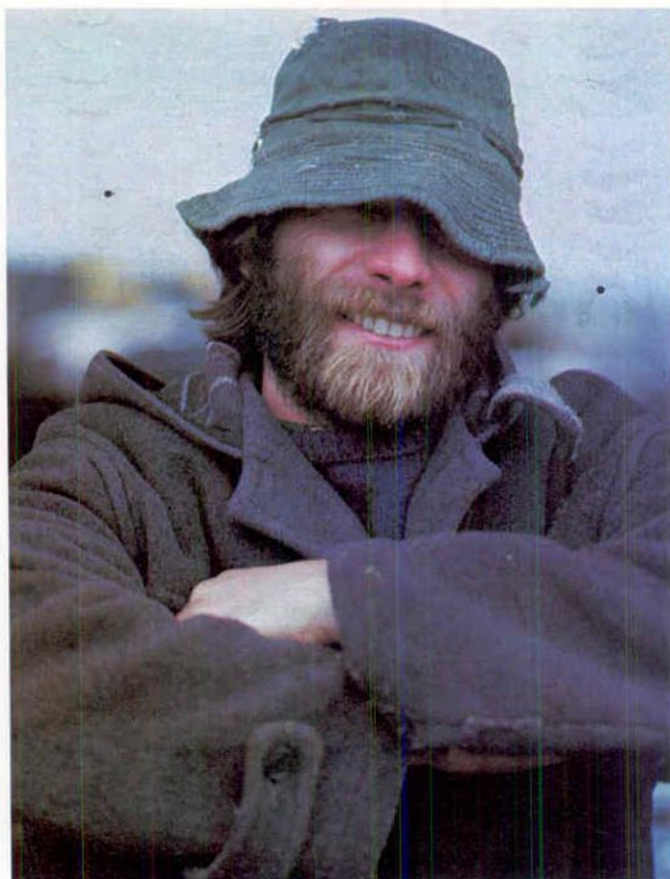


Animals A series of photographs taken around a farm would not be complete without these shots of the animals

the main problems George had to overcome. He explained: 'While I was walking around the farm, the main colours I noticed were the browns of the mud and the greys of the roads, the walls and the stone buildings. These made the scene look very gloomy, and would have produced uninteresting results.'

The best way he found of avoiding this was to try and leave out these areas altogether: 'Instead I looked for details of machinery, faces and the occasional localized areas of colour which I could find to photograph.'

With all this working against him, it was little help that George had a wide



George Wright

The farmer George wanted to include some photographs of people and used a 105 mm lens for this lively portrait

range of equipment to choose from. Using 35 mm SLR cameras, many of the shots were taken with either 20 mm, 105 mm or 300 mm lenses. He finds the 300 mm lens to be very useful for landscape work since it isolates details effectively and 'makes a picture out of almost anything'.

A tripod was essential for all of the shots because the light was low and Kodachrome 64 transparency film was being used. George could have used a faster film, but this would not have given such a good colour rendering.

George enjoyed his day's work: 'Trying to get the most out of a farm made me realize the wide range of pictorial possibilities which abound there,' he explained. 'There are always lots of interesting objects lying around which are crying out to be photographed. A pile of tractor tyres, an old scythe, a pile of fertilizer bags or a wide range of interesting machines are just a few of the photographic possibilities on most farms.'

'I was also lucky enough to have a colourful sunrise and sunset to help lift the series.'

Working in the cold and the rain was not easy and George always had to take care to protect his equipment. Nevertheless, he took home a successful series of shots.

Sunset The bad weather started to clear towards the end of the day and a sunset provided a fitting end





World of photography

Cameras in space

As the space age has seen man reaching new frontiers in science and technology, so photography has had to keep pace with his achievements

astronauts said they could see trains moving along tracks, the authorities disbelieved them. So the astronauts took pictures—and proved that the view from space is better than anyone ever imagined. Scientists pored over the pictures and found details that no one had ever noticed before, even from aerial surveys. From these discoveries was born a whole new science—that of remote sensing of the Earth's resources.

But another reason for photography—and in the space agency eyes, just as valuable—was its publicity value. As soon as the demand for spectacular space pictures was appreciated, it became obvious that to most people, the great value of space travel is in the photographs it sends back. And there was always the need to justify the huge cost of the space programme.

The astronauts were not trained photographers. They were chosen for their abilities to fly jet planes, become PhDs in a useful academic discipline such as engineering or astronautics, and remain unflinching when a gun was suddenly fired behind their heads. While a number of astronauts were keen photographers, with darkrooms of their own, to start with the authorities preferred that they stay in the role of camera operators with little opportunity for free ranging photography.

Later on in the Apollo and Skylab missions, however, there was more flexibility and some of the most rewarding pictures were gained as the result of unplanned shots.

The equipment they used was similarly inflexible at first. The basic camera used aboard Gemini and Apollo flights was a Hasselblad—the standard professional roll film camera. But the models were extensively modified, with little resemblance to standard units. While a normal Hasselblad has a reflex viewing system, with a mirror and matt glass

On the moon No picture brings home the achievement better than this shot from the Apollo 17 mission, showing the Earth high in the sky



NASA

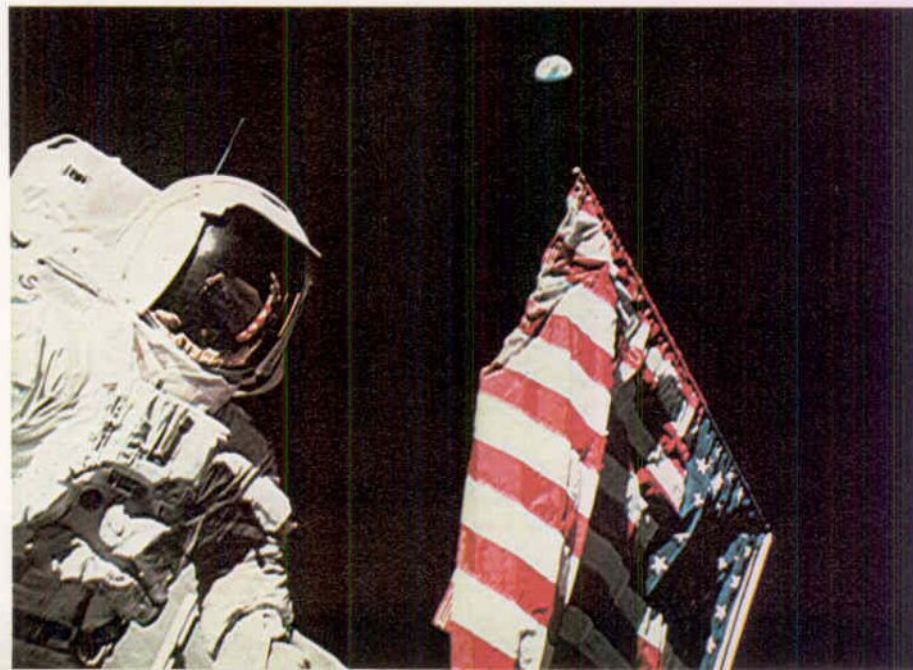
To the average person, the space age is summed up by a picture of the Earth itself, a globe as very few have seen it. In an age when satellites constantly watch over us, pictures of the Earth from space hold powers of life and death—from the weather satellites that help predict the onslaught of hurricanes to those which spy on other nations.

Yet some of the most significant space pictures ever were taken not by machines but by men—the astronauts who, with their photographs, brought space travel to those on Earth.

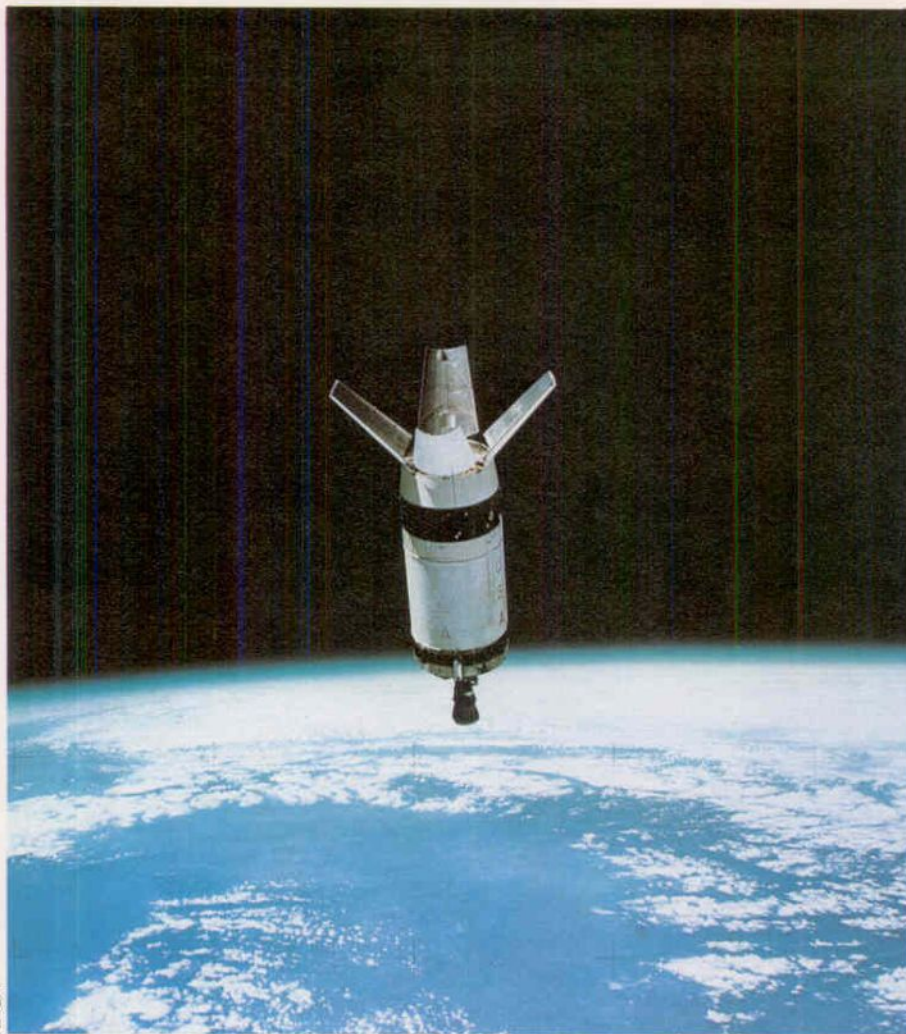
In the early days of America's space programme, photography was almost an afterthought. In the Mercury series, with five suborbital and orbital flights, only 300 pictures were taken by the astronauts. Yet many of these became widely distributed as the authorities realized their value.

One important use of photographs—the one which could be used to justify them in scientific terms—lies in their ability to record information about the Earth, and the space environment. When

Earth Perhaps the most significant photo ever taken of our planet shows it as the 'unified whole' often referred to by science fiction writers



NASA/Science Photo Library



screen, the space versions had these stripped out. One reason was that the viewing system provided added complexity. The other was that the space agency, NASA, had banned the use of glass on board spacecraft. A special dispensation was granted in the case of the camera lenses!

The controls of the Hasselblad also had to be modified, with extra large knobs and controls that could be operated while wearing spacesuit gloves. Another feature that changed was the leatherette trim. The US space capsules had a low pressure oxygen atmosphere, and any materials which would outgas—give off vapours—under low pressure were forbidden. So the space Hasselblads had a functional aluminium casing, either anodized black for space use or silver for the lunar surface, where the cameras would have to withstand the full heat of the sun for long periods. A shiny surface reflects the heat away, preventing the camera from overheating.

Internal changes included a change of lubricants to materials which would not ignite in the oxygen atmosphere, and the strengthening of the components.

The cameras took magazines of film designed to get the maximum number of exposures per loading. The film used was made of a thinner material than normal—polyester film rather than tri-

acetate—to help pack more in.

As well as the Hasselblads, the Skylab astronauts took Nikon 35 mm cameras. These were allowed to keep their reflex viewing systems, which pleased the astronauts. Alterations were still needed, such as modification of the electrical contacts in the cameras to prevent the risk of sparks.

Photographic lamps were used on Skylab for the first time. Again, they were well insulated to prevent exposed sparks or contacts. They made a great difference to the quality of the interior shots—earlier missions had used available light for their interiors.

In the early flights, just one film type was used, but for the Apollo missions the astronauts took a variety of film along with them. While the materials had code numbers, they were very similar to the conventional films available at the time—Ektachrome-X and High Speed Ektachrome at 64 and 160 ASA respectively. Reversal colour materials were chosen because they offered finer grain and sharper definition than negatives, and because the colour could not be affected in the printmaking back at the lab!

Calculating the exposure necessary on so many films and under a wide variety of conditions would tax the skills of an expert photographer. The Hasselblad has no exposure meter, and any meter-

ing device would be frequently fooled in the circumstances. A brilliantly illuminated spacecraft against a background of deep space represents just about the most difficult exposure problem imaginable—yet the astronauts had a high success rate.

The secret of their success lay not in metering but in exposure charts. The early missions normally used one exposure all the time—1/125 at *f*/11 on 64 ASA film. In effect, the camera was working as a simple box camera, with just one setting. The standard exposure allowed scientists to measure the amount of light available—even though the images were not always pictorially pleasing. But for most shots of the Earth, and for vehicle-to-vehicle pictures, this exposure was about right.

Working from this, the experts then drew up exposure tables for all conditions of illumination for use during the Apollo flights. Each film magazine used on the lunar surface, for example, was given a guidance panel which included a clock face, which represented the sun's angle. In each case, there was one shutter speed and the astronaut varied the *f*-number according to the sun angle.

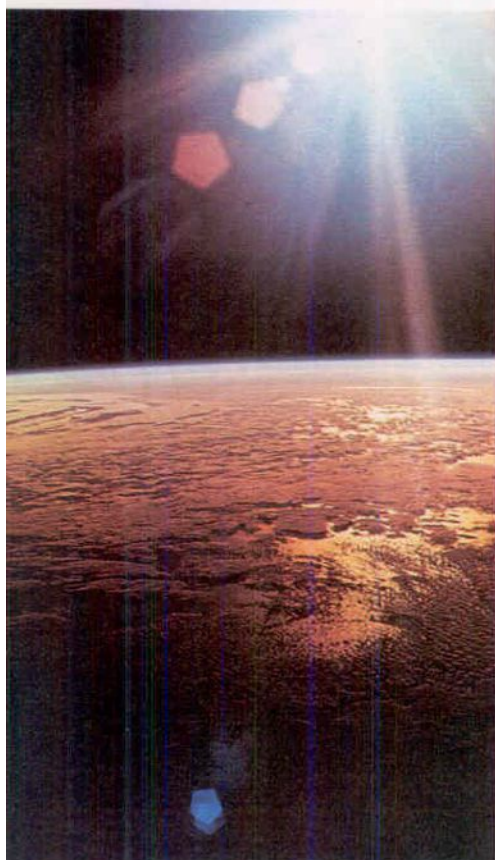
The system worked well. Each man was freed from the need to take meter readings which would in any case require careful evaluation before they meant anything. In fact, the astronauts did have a spot meter available—that is,

Booster adrift A spacecraft photographed in full sunlight needs a similar exposure to the Earth itself. In this case diffuse light filled the shadows

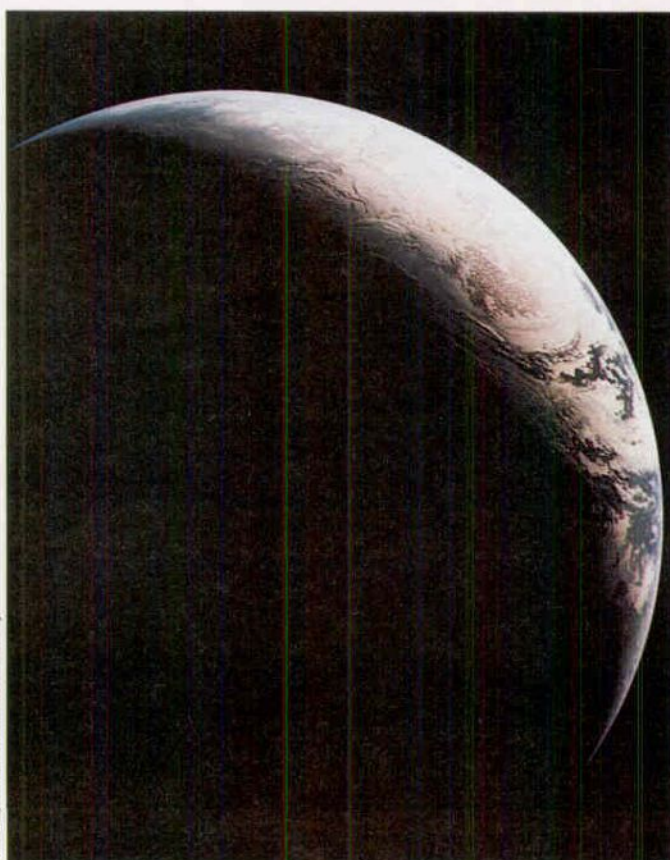




Hasselblad/Space Frontiers



NASA/Science Photo Library



Cape Canaveral
The detail visible on this view from about 150 km up gives some idea of the wealth of information that can be gained from space pictures
Inset: a space Hasselblad

Weather system
Pictures of Earth's ever changing clouds have proved invaluable to weather forecasters

Crescent Earth
This beautiful view, taken from an Apollo capsule, looks south west over the Atlantic

a light meter which looked at only a small part of the view—for use when photographing difficult objects not allowed for in the exposure panels. But they mostly used the panel guides with help always available from experts at mission control.

If exposure calculations were simple, the method of framing the picture was even more elementary. Because the Hasselblads had been stripped of their viewing systems, all the astronauts had to do was to point the camera at the object to be photographed. While working on the lunar surface, the cameras were attached to the bracket on the chest of the astronaut's spacesuit—so he simply had to point himself in the right general direction. The camera had a 60 mm lens—on the Hasselblad format, a semi wide angle—which usually took in the object to be photographed. For special framing requirements, such as when using telephoto lenses for example, sighting devices were available, but the astronauts used these surprisingly little.

Various unusual difficulties arose out of the special circumstances. Most photography of the Earth and Moon from orbit took place through the windows of the spacecraft. These windows could get surprisingly dirty, from such pollutants as engine gas, and the dumping of liquid waste. Such materials stay close to the spacecraft during its flight—at least one UFO scare has been due to a blob of the astronauts' own urine glinting in the sunlight some distance from the spacecraft!

Dirt on the outside of the windows affected the contrast and colour of the photographs, while lunar dust itself was a constant annoyance to moonwalking astronauts. In a hard vacuum, dust tends to stick to a surface rather easily as a result of intermolecular attraction. Some lunar surface shots therefore have an unwanted soft focus effect, with the production of haloes around the astronauts' shiny helmets—causing much speculation among the uninformed when the shots appeared.

Moon man While working on the lunar surface, the astronauts used cameras fastened to their spacesuits



NASA/Danzig

Lunar surface A classic view. The crosses in this picture are actually on a grid plate inside the camera, to help in later analysis

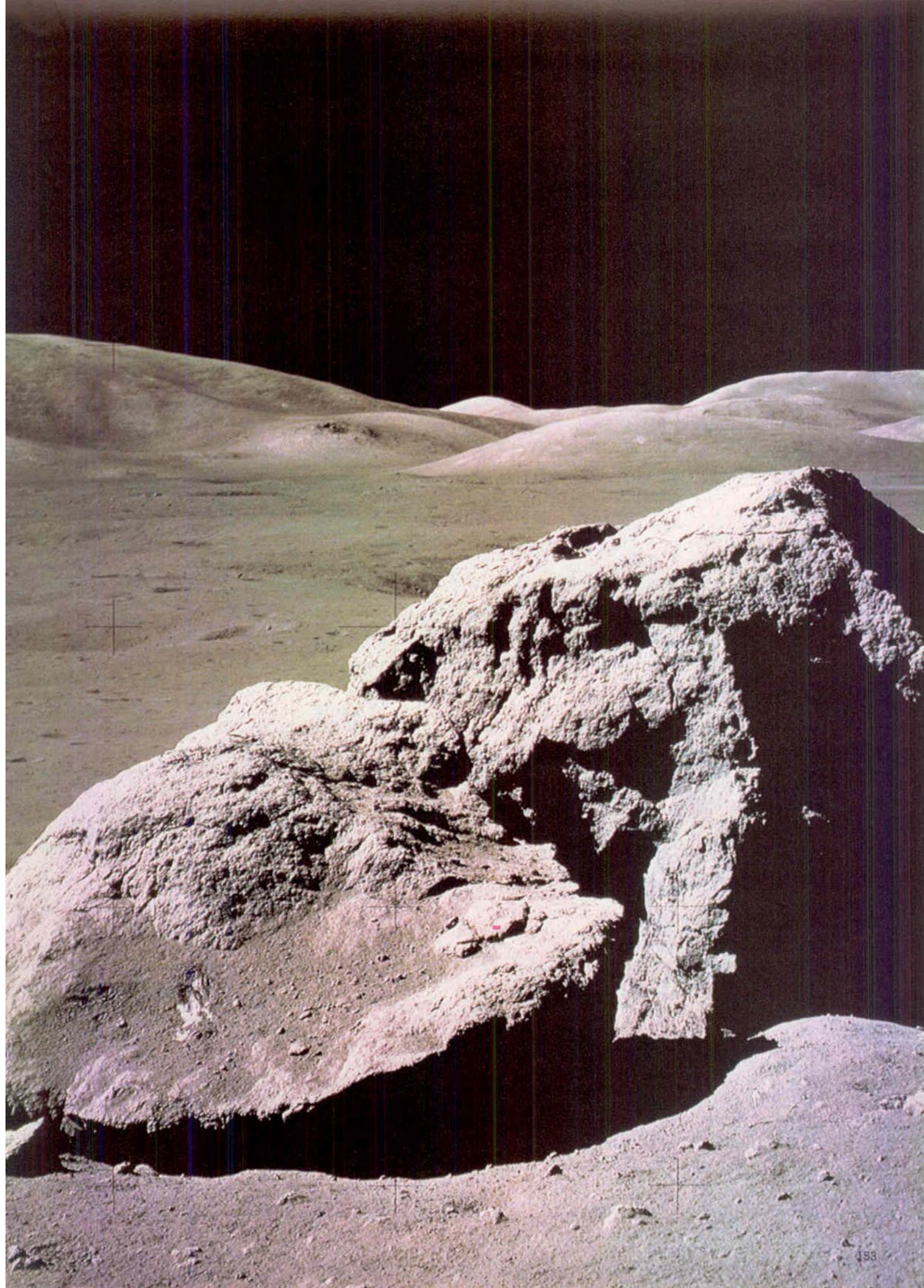
Into the sun Shots such as this one were made possible because of the exposure guide on each film magazine. Taken on the Apollo 14 flight in 1971



NASA/Space Frontiers



NASA





Improve your technique

Keeping the camera steady

Many photographs have been ruined because they are unsharp. One common cause is camera shake. Extra support may be the answer

Unless you purposely want a blurred picture, keeping your camera steady while shooting is crucial. And the longer the exposure or lens that you use, the more crucial it becomes.

In normal circumstances it is unwise to attempt hand-holding your camera at shutter speeds of less than 1/30 second. This becomes more critical with long focal length lenses because they can be heavy and make the camera wobble. As a rough guide, a support for your camera should be used when shooting with a 500 mm lens at less than 1/500 second or with a 200 mm lens at less than 1/200 second.

There are various methods that can be used to keep your camera steady. The best is a tripod but if you do not have one on the spot it is possible to improvise with varying degrees of success.



John Heseltine

Camera support The best method to use is a sturdy tripod and a cable release. This is essential for telephoto shots or in low light

Adding support



Crouching with knee support

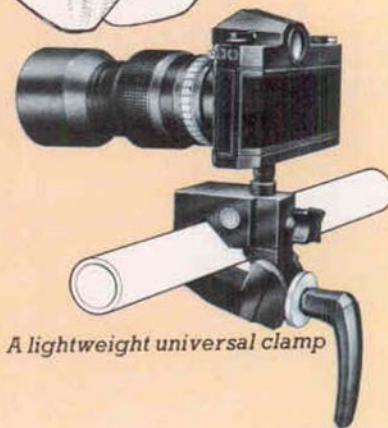


Lying down using your elbows



The correct stance

Using a soft camera bag



A lightweight universal clamp

If you have nothing else to support your camera but yourself, you could try sitting down or squatting and firmly resting your elbows on your knees, keeping perfectly still during the exposure. Even if you simply dig your elbows firmly into your rib cage this can be better than simply using the normal hand-held position.

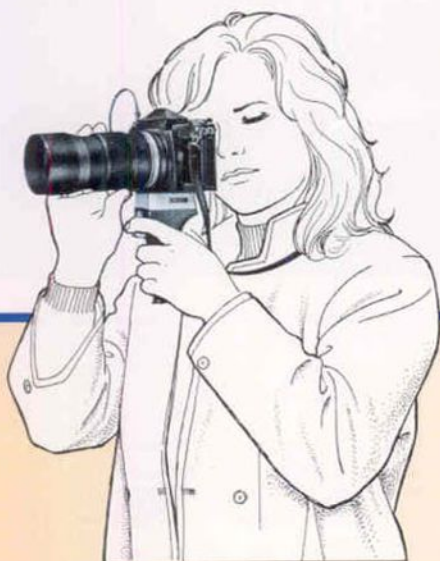
Since in this situation your body is acting as a sort of bipod, you could try steadying yourself—and thus the camera—somewhat more by leaning against something solid, such as a tree, and becoming more like a tripod. Even better results can be obtained if you instead place the camera on a solid object, such as a wall or rock.

Lying on the ground with the camera in front of you is a further simple, but obviously restrictive way to keep your

Low light shots Unless your camera is firmly supported, it is impossible to take shots like this without camera shake spoiling your picture



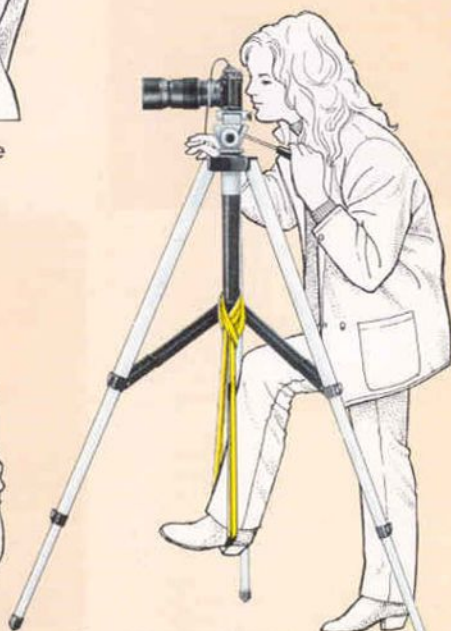
Clive Sawyer/Zefa



A pistol grip with cable release



Monopods need extra support



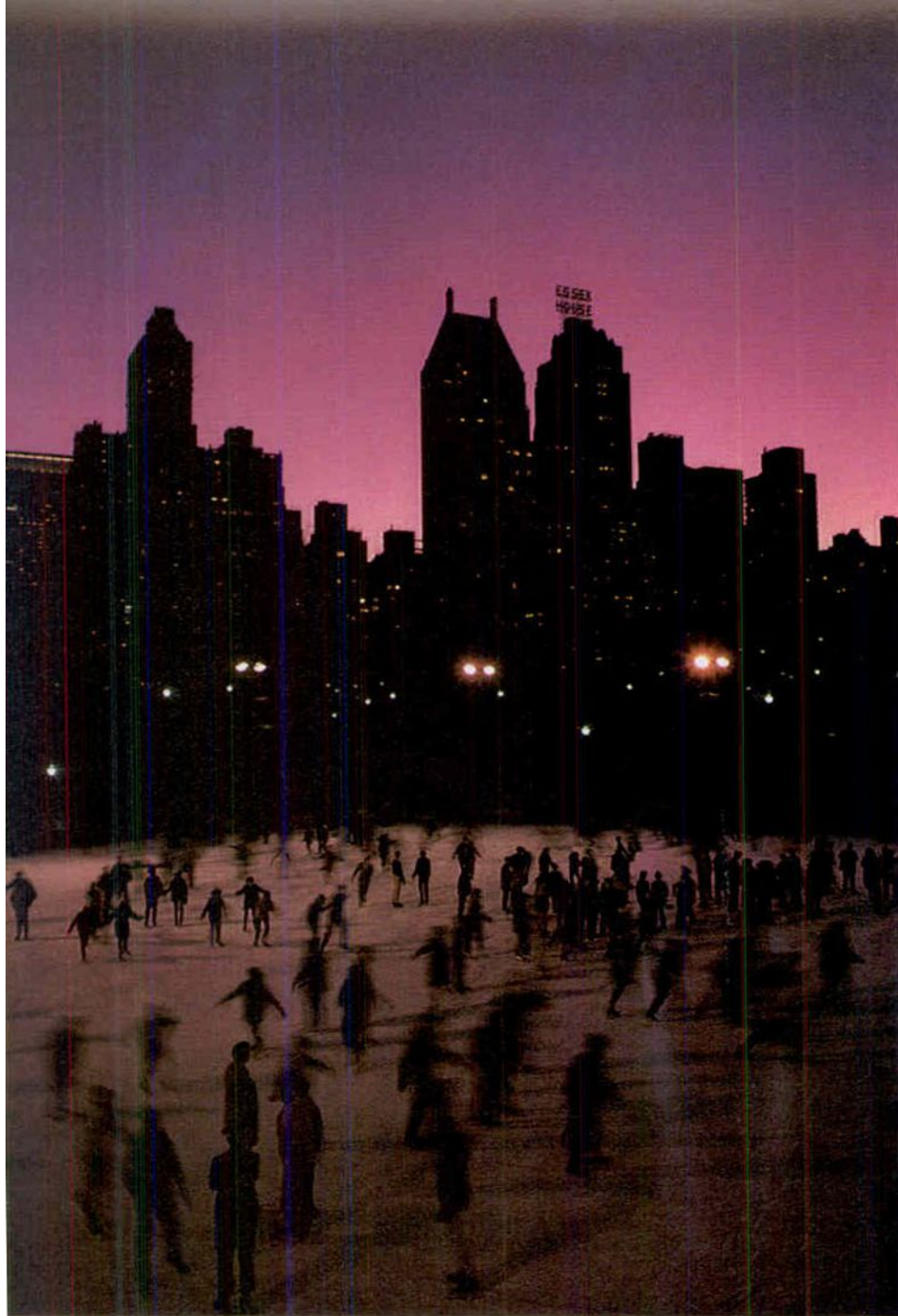
Adding rigidity to a tripod

A mini tripod on a rock



A wall or a nearby post can be used to stabilize the camera or the lens

Jeremy Gower



Skaters To shoot in low light you will need slow shutter speeds, and moving subjects will blur. If the rest is sharp this is an effective technique

Butterfly For close-up work extra support is essential. The light level is low and absolute steadiness is needed for focusing

Lion Wildlife shots are nearly always taken with long focus lenses, which exaggerate the slightest movement of the camera

H. Gioaquin/Viva

camera reasonably steady. Another useful technique is to use your camera strap, stretching it out tightly in front of you, either from your neck or, say, a branch or railing.

With a twin lens camera you could hold your camera steady upside down against a roof or other object within easy distance above your head, such as under a low bridge, archway or firm branch.

A useful and simple support which is easy to carry around is a bean or sand bag, or better still a piece of 10 mm thick foam, which is even lighter and more compact. This type of support can provide a solid base, especially for low level shooting or when a ledge such as a car window is being used as a rest. Sometimes a soft camera bag can be used for the same effect.

An efficient way of supporting the camera is to use one of the wide range of

clamps that are available for this purpose. A typical clamp has a mount which screws into the camera's tripod bush, and has a pair of jaws which allows it to be attached to any convenient object. Attachments are available for fixing clamps to fences, posts, furniture or any other firm anchor points. There is even a clamp which can be fitted to windows by means of suction pads.

If you intend to use such a device, choose one which is easily portable as well as one which has more than one use. You should also try and find a clamp which is strong enough to support your camera with a long lens fitted.

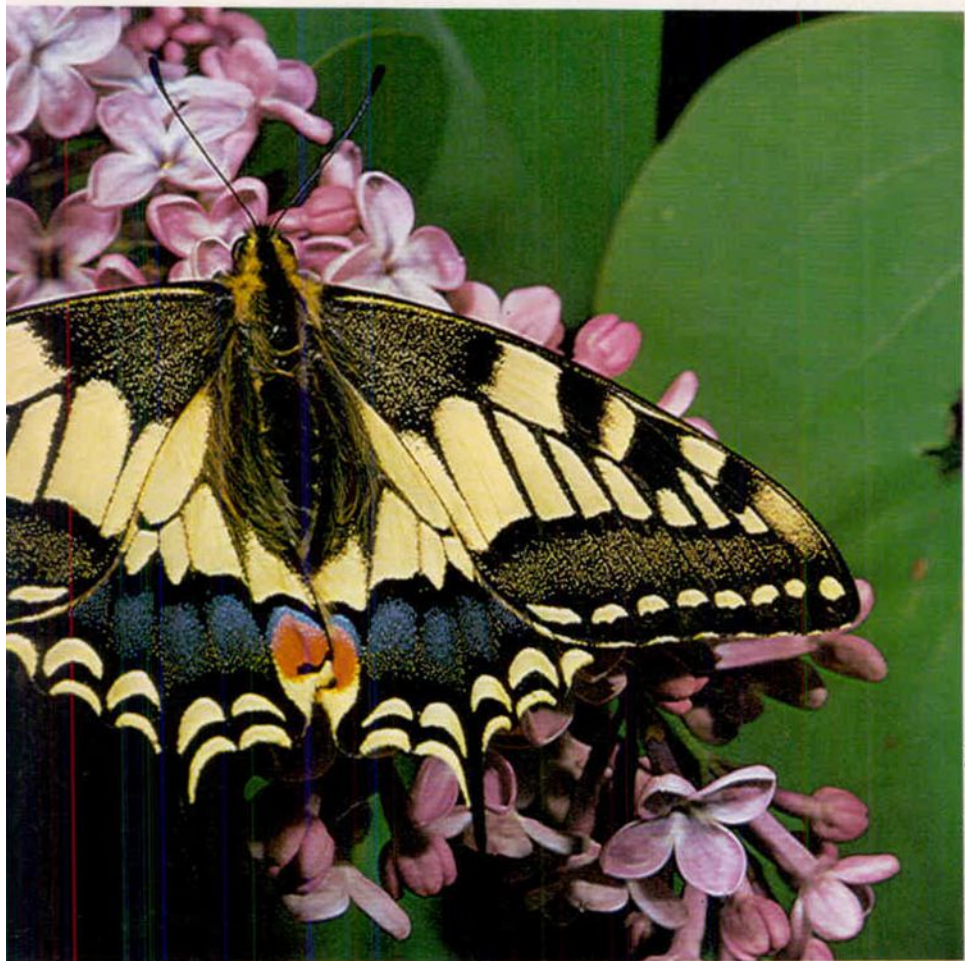
Another type of portable and compact support is the pistol or rifle grip. These are particularly useful when covering fast events, such as Grand Prix racing, when a tripod would be too cumbersome to operate. These types of supports are

Reducing vibration

Some cameras have facilities which help reduce camera shake. With the single lens reflex camera, the mirror jumps up when the shutter is clicked, and this can cause quite a lot of vibration. On some SLRs you can lock the mirror up before taking the shot to avoid this, although there is the disadvantage that nothing can then be seen through the viewfinder.

The pressure of one's finger on the shutter can also cause some camera shake, and this can be avoided on models which have delayed shutter releases, allowing the shutter to be fired automatically. Similarly, a cable release can enable you to click the shutter without handling the camera.

In addition, there are some cameras which have a specially built soft shutter release.



Rigidity, however, can be markedly improved by hanging a bag of stones or some other weight from the tripod head. This can be especially useful in high winds or blustery weather.

Another method is to join together two or more straps and hang them from the tripod head. This can then be used as a foothold on which to exert downward pressure. This can be useful for adding rigidity to the tripod when either the camera and lens are a heavy unit or when there is a strong wind.

Miniature table-top tripods are also available and are small enough to be used almost anywhere where a flat surface is available, such as a table or even a wall. Some makes are extremely solid, sometimes more so than a heavier stand. In addition, a table-top stand can be braced against the photographer's chest. These tripods can easily be slipped into a camera bag and are very useful things to take along if you are travelling or if you take your camera with you on walks or other occasions when a large tripod is too heavy. The versatility of the table top tripod makes it a valuable accessory.

There are many situations where holding the camera by hand is simply not sturdy enough to secure a shake-free exposure. In such circumstances, a rigid tripod is obviously the best thing to use, but there are many other alternatives. It is really a question of using your head—or more likely, some other part of your body!

John Markham/Bruce Coleman

often fitted with a cable release for the shutter and are braced on the shoulder.

A monopod—a single pole with the camera fixed to the top and the bottom firmly pushed to the ground—is very useful for keeping the camera steady for location work, when a tripod would prove too bulky or difficult to use.

They are light to carry and inexpensive, but not advisable for cameras with a larger format than 35 mm or for shutter speeds below 1/15 second.

By standing or kneeling with the monopod braced firmly against one's body, it is possible to turn it into an effective tripod. The effectiveness of a monopod is largely determined by the way you use it. It will not do all the work for you, so it needs careful use.

The best way to support one's camera, however, is with a firm rigid tripod, although this is also the most expensive method. Tripods come in a variety of designs, sizes and weights. The heaviest—and therefore the firmest—are best of all, but if the tripod is too heavy it will not be portable. As a general rule, the heavier your camera, the heavier and stronger your tripod needs to be.

The heavy duty tripods are mostly used with cameras larger than the 35 mm format and are therefore often limited to studio or location work, when an extra-sharp photo can be critical.

Portable tripods should be rigid if they are to be any use, but some of the lightest full size tripods are far too flimsy.

Jerry Young



Inside an SLR

Single lens reflex cameras let you see exactly what will be in the picture, and accept a wide range of lenses and accessories. Although they vary in detail, all SLRs work in much the same way

The most popular type of camera available for the enthusiast is undoubtedly the 35 mm *single lens reflex*. This rather long and complex name describes what is essentially a straightforward optical system which makes focusing and viewing simple: *reflex*, because the light from the lens bounces off a mirror before reaching the photographer's eye, and *single lens*, because there is only one lens which serves both for viewing and for taking the picture. (Some reflex cameras—twin lens reflexes, or TLRs—have two lenses, one for viewing and a separate one for taking the picture.)

The reflex system is simple and usually very reliable. It has three main elements: a hinged mirror, a matt focusing screen, and a five-sided glass prism called a *pentaprism*. The mirror normally rests at an angle of 45° below the focusing screen, behind the lens, and projects the image formed by the lens upwards onto the screen. The pentaprism reflects this



Leo Mason

image so that it can be seen through the eyepiece—in effect, a simple magnifying glass—at the back of the camera, behind the prism.

The mirror and screen

The reflex mirror is a thin sheet of glass, coated on the front with aluminium—coating on the back would result in double images. It is hinged at the top. When the shutter release is pressed, it swings up out of the way, so that

Cycle race SLRs are essential for accurate composition with long telephoto lenses

light can reach the film. It also seals off the viewfinder so that light entering the eyepiece cannot reach the film. After the exposure, the mirror swings back down again, so that the image is once more visible in the viewfinder. For most exposures, the image vanishes for a very short period, less than

the blink of an eye.

The focusing screen is generally made of plastic (despite the fact that it is usually called 'matt glass', or 'ground glass') and the image formed on the lens, which is reflected by the mirror, is seen on this screen. Since the film and screen are the same distance from the lens, the image formed on each is the same. When one is in focus, the other one will also be sharp. Turning the lens barrel brings the image into focus, so the photographer can see the effect on the screen. This is probably the greatest advantage of the SLR: what you see on the screen is precisely what you get on the negative or slide.

The screen has a number of aids to focusing. These are called microprisms and split image rangefinders, and are described in detail in the box on page 89. They make it easier to see the exact point of sharp focus, though in normal light this should not be difficult.

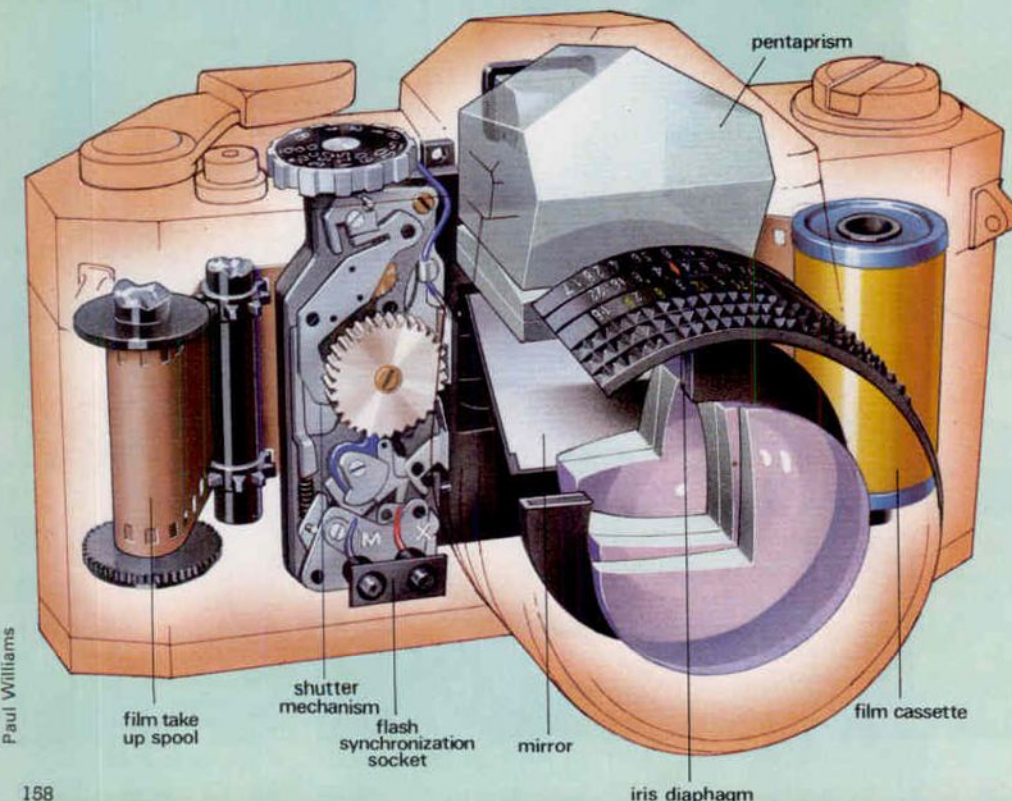
If an ordinary matt screen were used, it would be bright in the centre, and dark at the corners. To avoid this, all SLRs have a type of lens below the screen to gather the light, making the image appear equally bright all over. This is a *fresnel lens*—it is thin and flat, and not convex like a normal lens.

The focusing screen in most cameras shows only a certain amount of the image—usually about 90 per cent. The cut off at the edges of the frame gives a small margin for error in the composition of the photograph.

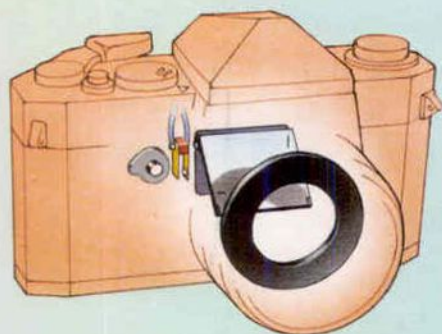
The prism and eyepiece

The pentaprism reflects the image of the screen three times before it reaches the eyepiece. These reflections ensure that, when the photographer looks through the

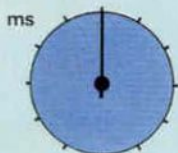
Camera construction Most 35 mm SLRs have the same general arrangement



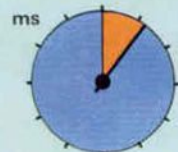
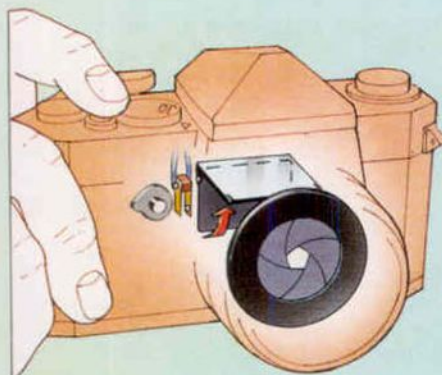
Paul Williams



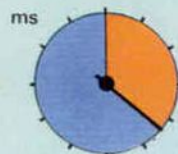
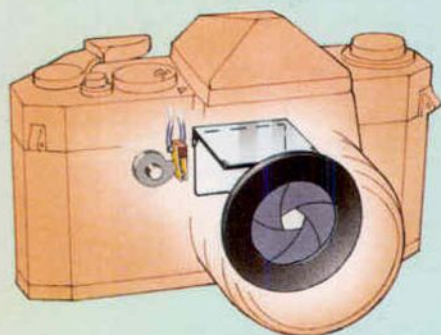
Elapsed time



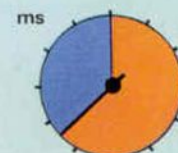
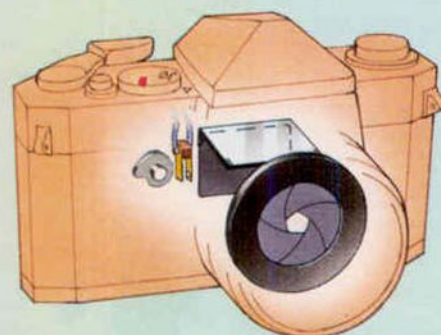
Viewing Before the shutter is released the lens diaphragm is at full aperture to aid focusing



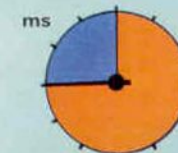
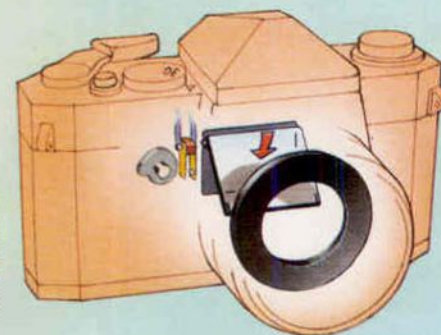
Button pressed The mirror rises and the diaphragm closes to working aperture within 6 milliseconds



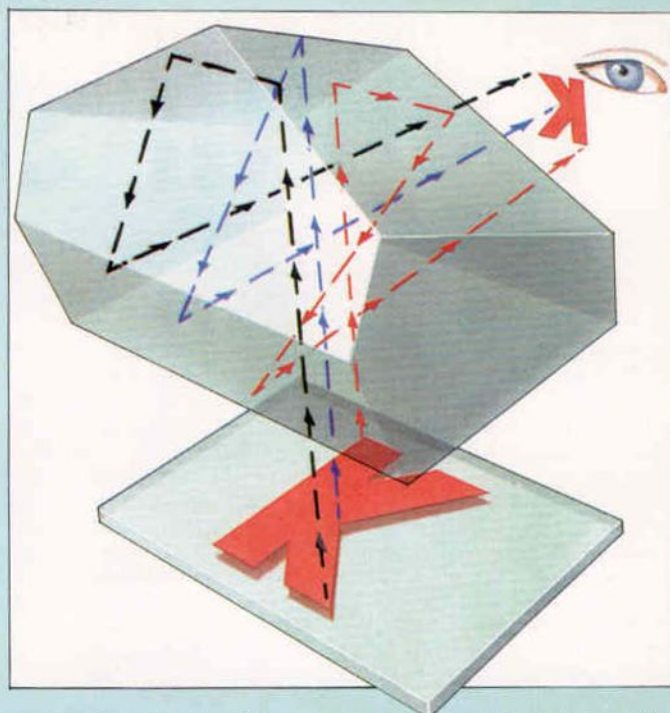
Shutter open When the shutter is fully open, the flash contacts are closed to trigger the flash



Shutter closes As soon as the set time has elapsed, the shutter snaps shut, covering the film



Mirror falls Finally the mirror falls, and the aperture opens up again for viewing



Paul Williams

Pentaprism Three reflections reverse the image on the focusing screen

viewfinder, the image is seen the right way round, and not inverted. The image on the film is both inverted and reversed, which makes composition difficult. The correcting action of the prism remedies this.

The eyepiece of most SLRs is adjusted for people of normal eyesight. Short- and longsighted photographers need corrective eyepieces if they are to use the camera without their spectacles.

The lens

All 35 mm SLRs accept interchangeable lenses, which are usually fixed to the camera body by some kind of bayonet fitting. Focusing the lens is carried out by a screw thread which runs round the inside of the lens tube. This is called a *helicoid*. When the lens barrel is turned, the lens moves closer or further away from the film, and distant or nearby objects are thus made sharp.

All the lenses contain an *iris diaphragm*, which is described more fully on page 46. On most SLRs this is kept at full aperture for focusing and composing, and is stopped down at the moment of exposure to the working aperture, which is

set by a control ring on the lens. This means that the image on the focusing screen is bright and easy to see through the viewfinder, but is the correct brightness when it reaches the film.

Exposure meter

Most SLRs have some sort of an exposure meter, which usually reads through the lens (often abbreviated to TTL). This measures the light falling on the focusing screen, and on an automatic camera adjusts the aperture or the shutter speed to give the correct exposure.

On manual models, the meter causes a display in the viewfinder to indicate the correct exposure. The photographer then has to set the camera controls to give the right exposure.

Besides the exposure meter readout, which often takes the form of light emitting diodes—LEDs—or a meter needle, many cameras display either the shutter speed set, or the aperture in use, sometimes both.

The shutter

Virtually every 35 mm SLR has a *focal plane shutter* (see page 84). These simplify the construction of the camera, and make it easier to use interchangeable lenses. The shutter, the aperture and the mirror all work together in a precise sequence, repeated each time a picture is taken. This is controlled by gears and cams in the camera body.

SLR sequence At 1/30 sec shutter speed, the sequence takes 3/4 sec to complete

Paul Williams

Colour slide film

If your aim is perfect colour, then slide films are the best choice. There is no loss of quality in intermediate stages and, unless you want prints from every picture, slides can work out much cheaper

Although the sale of colour print films dominates world markets, colour slide film is still the first choice for the vast majority of professionals, as well as many serious amateurs. The reasons are not hard to find.

Top class results are easier to get with colour slides. With no intermediate negative stage, where errors or variations can creep in, it is easier to guarantee the quality of the final image. Because the picture is seen by transmitted light rather than reflected light, the range between the lightest and darkest part of the image is much nearer to the original scene. And not only is the cost of getting a really good transparency much less than that of an equivalent print, but the time taken to get it is also considerably less, which is a big advantage for many professional photographers.

The main difficulty with slides is the fact that they are difficult to duplicate or to transform into prints. Modern processes have overcome these limitations to some extent but if you do want a large number of copies of one picture rather than one very fine one, you would be better off with negative film.

Types of film

The human eye is very adaptable. When you walk indoors at dusk you often notice that the light from the bulbs seems a little yellow. However, your eyes soon adapt and you forget the original impression. Slide film does not. It is designed for use in one type of light only. It can, therefore, be divided into two basic types: that intended for use in daylight and with electronic flash, and that intended for the tungsten lighting found in many photographic studios. Of these two types, daylight film is far more common—tungsten film is more limited, both in availability and use.

It is, however, possible to use films balanced for one type of lighting with another as long as you fit a conversion filter on the camera lens. To use daylight film in tungsten lighting you need a fairly strong blue filter such as a Kodak 80B. However, the disadvantage of this method of working is that the filters absorb some of the light and so, effectively, decrease the speed of the film. For example, when used with an 80B filter, a daylight film which normally has a speed of 64 ASA (ISO) is slowed to 20 ASA.

All colour slide films change their balance slightly as they age before being used. Films designed primarily for

amateur use have a slight colour bias when they leave the factory. This bias gradually lessens until, after about six months, the colour balance of the film is neutral. This allows for the delay while the film sits on the dealer's shelves prior to sale. Professional films, on the other hand, have a neutral colour balance when they leave the factory and must be used straight away or stored under refrigeration to preserve this neutral balance.

Processing

There are four important processes currently in use: Kodachrome, Agfachrome, Ektachrome E6 and Ektachrome E4. In most countries Kodachrome must be returned to the manufacturer for processing as the sequence is much more delicate and complicated than the other processes.

The Agfa process is carried out world-wide by Agfa-Gevaert's own laboratories and there are usually a number of independent firms offering a service for Agfachrome Professional.

A few laboratories still offer an Ektachrome E4 service, but this process has now been largely superseded by the newer E6 process. E6 is probably the most popular current process and has been adopted by several other manufacturers, such as Fuji, Sakura and 3M,

for their films. Most independent laboratories offer E6 processing, especially in Britain and America.

Home processing kits are available for the Agfa and E6 processes, both from the film manufacturers and from independent companies. It is not a difficult task but it is time consuming, and is only worthwhile if you process a large number of films. For the occasional user, commercial processing is cheaper.

Film characteristics

Because of the inherent limitations of the photographic colour process, no colour slide film has yet been produced that matches the original, colour for colour. Some films produce brilliant, saturated colours while others give softer results. Some give a cool overall reproduction with the balance tending towards blue; others give warmer results. Some films are particularly well suited to portraiture because they give fine skin tones while others reproduce foliage well and are more suited to landscapes. So, the first thing to look for in choosing a colour slide film is an overall colour balance suited to the type of picture you intend to take.



The speed of the film you choose is important as it governs the range of apertures and shutter speeds you can use for any particular picture. If you are interested in action you might choose a fast film, perhaps as fast as 400 ASA. If your interest lies in landscapes or close-up work, a slower film with finer image qualities would be more appropriate.

Sharpness governs the amount of fine detail that can be seen in your slide and, as a general rule, slower speed films appear to be sharper than faster ones.

Another important factor is the graininess. Fine grain films tend to give better definition although this is not always so. Again, as a general rule, the films with the slowest speeds have the finest grain, those with the highest speeds the coarsest.

The manufacturing processes involved in the production of slide films are very closely controlled, but, even so, there can be very small variations in speed and colour balance between different batches of film. Fortunately, these variations are minute and make no difference to the vast majority of photographers.

All colour slides consist of an image made up of dye granules and, as with all dyes, these can fade in time. However, some films are less susceptible to fading than others and the life of all slides will be prolonged if they are kept in the dark in a cool, dry place. Current Kodachrome films have probably the longest life expectancy; at normal room temperatures they can be expected to keep in good condition for at least 50 years after processing. The

life of other types of colour slides is of the order of 15 to 30 years at room temperature.

Films available

There are a large number of colour slide films currently available, all of them capable of producing excellent results. The one you pick will depend largely on your personal taste and the type of photography that interests you.

Because the manufacture of colour film is a very complicated process involving an enormous capital investment, there are very few manufacturing companies despite the apparently large number of brands on the market. Major manufacturers make and package films for other companies and this is why there is such a variety. For example, 3M make film for several independent companies. So, if the film says 'Made in Italy' on the carton you can be fairly sure it was made by 3M. The three following makes dominate the market.

Agfa

This German company makes five slide films—all under the Agfachrome label—CT18 (50 ASA), CT21 (100 ASA), 50S Professional (50 ASA), 50L Professional (50 ASA Tungsten), and 100 Professional (100 ASA).

All these films have a very slightly warmish colour balance and excellent sharpness but are slightly granular. They are fairly contrasty and have a latitude of roughly half a stop to under and over exposure. The colours are very natural and fairly well saturated. All Agfa films are very tolerant to changes in the colour of the light. Films processed by Agfa are returned in plastic mounts. They can all be processed at home, although CT18 and CT21 are sold process paid.

Fuji

Japan's largest film producer offers Fujichrome R100 with a speed of 100 ASA. It has a slightly magenta (pinkish) colour balance and slightly diminished saturation. Latitude is excellent at one stop for both under and overexposure. The film appears sharp but is slightly grainy. It is also rather susceptible to changing lighting conditions and colour temperature correction filters are necessary for the best results. Although compatible with the Kodak E6 process, Fujichrome is sold process paid.

Kodak

This company has the widest range of colour slide films available. They can be divided into two groups, Kodachrome and Ektachrome. Kodachrome is available as Kodachrome 25 and Kodachrome 64, the ASA speeds being indicated by the numbers. K25 is the sharpest, least granular colour slide film currently available, followed by K64. Both produce very bright, saturated colours, especially reds, despite an overall tendency to coolness. Shadows tend to be a little green and highlights sometimes go

slightly pink. Skin tones are excellent—the best available. Both films tend to produce bluish results in cloudy conditions, but a Kodak 81A or 81B filter will correct this. Latitude is half a stop to both under- and overexposure. Both films are sold process paid only. The slides are returned in cardboard mounts. The Ektachrome range consists of four films in both an amateur and professional form: Ektachrome 64, Ektachrome 50 (tungsten), Ektachrome 200 and Ektachrome 160 (tungsten). There is also Ektachrome 400 which is available as an amateur film only. The number of each one indicates its ASA speed.

The overall colour reproduction of the Ektachromes is rather less saturated than the Kodachromes and the latitude is rather wider at one stop for overexposure and half a stop for underexposure. Ektachrome 400 has a one and a half stop latitude to over exposure. All of these films have a tendency to go blue very easily with cloudy conditions and it is advisable to use an 81A filter at all times, except when it is heavily overcast when an 81B is required. This produces very natural colours, especially skin tones. Sharpness and freedom from graininess are excellent, though Ektachrome 400 is less advantageous in these respects than the slower films. These films are sold process unpaid. They can therefore be dealt with at home or by an independent laboratory.

Other makes of film

There are a number of smaller companies making colour slide film, and abroad you may find the dealer's shelves stacked with unfamiliar boxes. The most common brands are Perutz, Orwo, Sakura and 3M.

Perutz film is processed in Agfa chemicals, and has characteristics that are similar to Agfa. Its speed is 64 ASA.

Orwo film is made in East Germany, and is available in speeds of 50 and 100 ASA. It can only be processed in Orwo chemicals. Grain is rather coarse.

Sakura film is E4 compatible, and is rated at 100 ASA. Colour balance is good, and saturation is quite high.

3M film can be processed in E6 chemicals, and is available in 100 and 400 ASA versions. Many 'own brand' films are repackaged 3M. Grain and sharpness are good, though colour balance tends towards green.

Exact speed Professional films have the precise speed printed in red on the leaflet with the film

KODAK EKTACHROME 200 Professional Film (Daylight)

Process E-6
A high-speed colour reversal film intended primarily for exposure to daylight, blue daylight, and electronic flash illumination.
The following information, determined at the time of manufacture, applies to film packaged in boxes.
The following information, based on average conditions, is to determine speed under various light sources.

LIGHT SOURCE	SPEED	WITH FILTER SUCH AS:	
		None	KODAK 81B, No. 80B, KODAK 81B, No. 80A

Daylight	ASA 200 24 DIN		
Electronic Flash (5000 K)	ASA 40 18 DIN		
Tungsten (3200 K)	ASA 50 18 DIN		

Handling and Storage: Ektachrome film should be kept in a refrigerator at 12°C (55°F) or lower, in the original sealed package.

READ THIS NOTICE: This film will be replaced if defective in manufacture, labeling, or packaging, or if damaged or lost by us or any subsidiary company. Except for such replacement, the sale, processing, or other handling of this film is without warranty or liability even though defects, damage, or loss in camera or otherwise may be claimed. Since color dyes may in time change, this film will not be replaced by, or otherwise warranted against, any change in color.

Kodak and Ektachrome are trademarks.

DEUTSCHE

Bright balloons When colour quality is a priority, slide films will usually produce the best results



Chris Davies

Slide films tested

**Kodachrome
25**



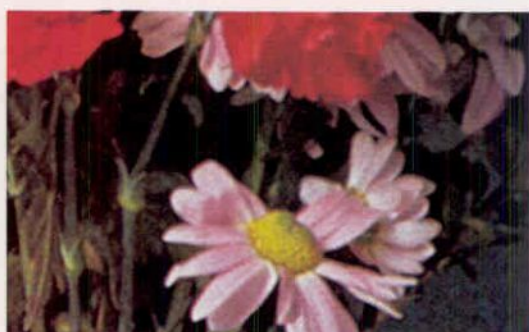
**Kodachrome
64**



**Ektachrome
64**



**Ektachrome
Professional
64**



**Ektachrome
200**



J. W. Myers

Ten films were tested in identical conditions, and a portion enlarged 20 times for a comparison of grain and sharpness. All films were processed as recommended by the manufacturer

**Ektachrome
Professional
200**



**Ektachrome
400**



**Agfachrome
CT 18**



**Agfachrome
100**



**Fujichrome
100**



J. W. Myers

Making a test print

Test prints are an essential, but often neglected, part of the printing process, and to get high quality prints consistently, you must be able to make strips and interpret the results

Only the most experienced of printers can produce top-quality enlargements by simply looking at a negative and guessing the treatment needed. Without learning the background skills, the newcomer faces hopeless odds in trying to make good first-time prints. The exercise is likely to be wasteful and expensive if tried—the most reliable way to success is to make *test prints* first.

The main purpose of a test print is to enable you to work out printing times for your negatives in a methodical manner. It is, in fact, another stage to go through before making the main print, but you do not need a new test print for each enlargement.

Test prints help you to decide on and check a number of other points also:

First of all, they can be used to check the sharpness of the actual image, the graininess of a print at any enlargement, and the presence or extent of negative damage. A quickly made test print can also be your first idea of what sort of print a negative will actually give, helping you to decide whether or not to proceed with a full scale enlargement.

Usually, however, a test print is used specifically to help you decide the correct printing exposure by showing the effects of different print exposure times. A variety of exposures can be made on a single piece of paper and

you select the appropriate exposure for your final print. An economy tip is to make your tests on strips cut from a large sheet of paper. This is why test prints are often referred to as *test strips*. You can also use these sets of different strips to determine a suitable choice of paper contrast grade, or even to compare the reproduction of tones from the negative between any two paper grades.

Another use of the test print is to assess the evenness of enlarger illumination, both to prevent printing faults (such as *hot spot* or *vignetting*), and to set up an enlarger properly by checking its stability at the chosen extension. Image sharpness may also be checked.

On each processed film, every frame may have been exposed differently and some negatives may be very dark (dense) while others are very light (thin). Each one needs slightly different exposure. Fortunately, you can divide them simply but carefully by eye into three broad groups—dense, normal, and light negatives. You can then make a single test strip for each group from a typical negative.

Effective tests

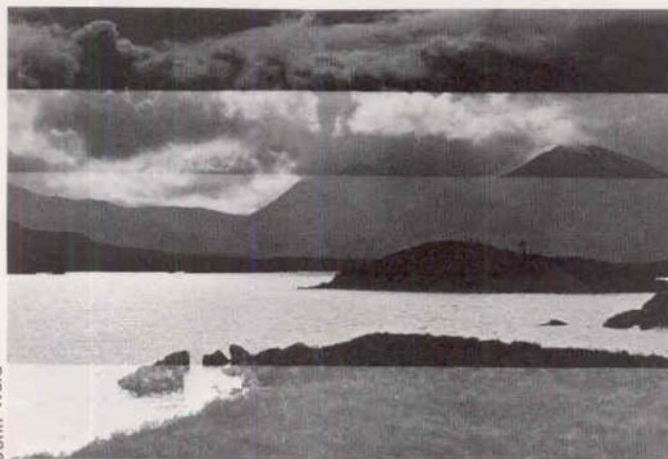
A great deal of print paper can be wasted by incorrect exposure, but mistakes can generally be rectified since you still have the negative and can try again. Waste can be expensive, however, and you should try to precisely duplicate the procedure you will adopt with the main print when you make the test strip. For example, make sure you give it exactly the correct development time.

As you will probably be making a test print just before the main print, there is usually no need to remove the negative from its carrier in the interim. So, before placing the negative in the carrier, ensure that both are free of dust and hairs. Check the test print for dust specks that may be on the negative.

Making a test print

With equipment and chemicals prepared and room lighting switched off in preference to safelighting, you are ready to make a test print. The procedure for making a test of five different exposure steps is as follows:

Switch on the enlarger and extend the enlarger column to give the desired image size. Focus and compose the image on a border masking easel frame. Set the lens at its maximum aperture to focus, since it is easier to see



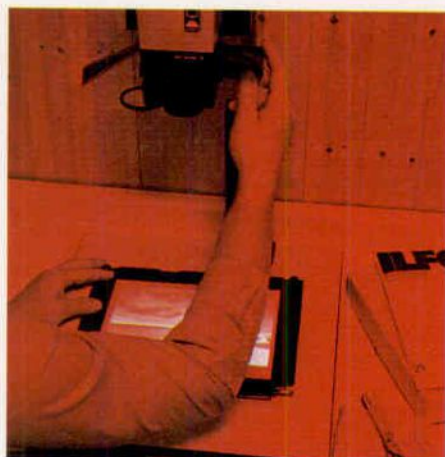
Test accuracy

A test is only effective if the strip of print covers a representative area of the negative image. A test print of a landscape has to embrace sky, middle and foreground detail (as above). This one covers exposures of 5, 10, 15, 20 and 25 seconds. Horizontal strips (left) are useless

Test print sequence



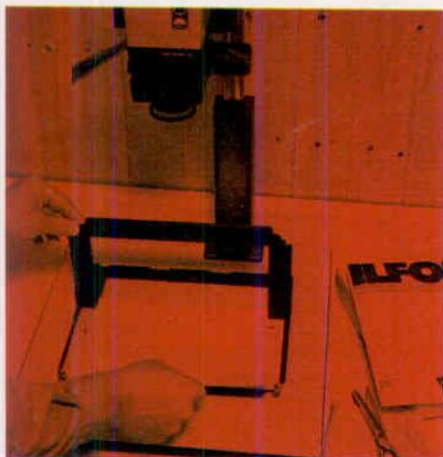
1 Lay out your equipment in the 'dry' work area then prepare developer, rinse and fixer baths. Carefully select and clean your negative



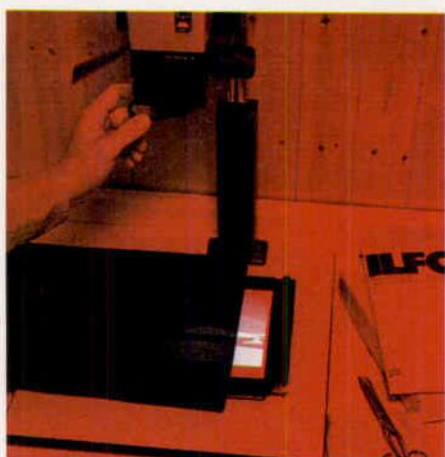
2 Put the negative in its carrier and adjust the height of the enlarger head to give the required image size. Focus and compose the image at full aperture



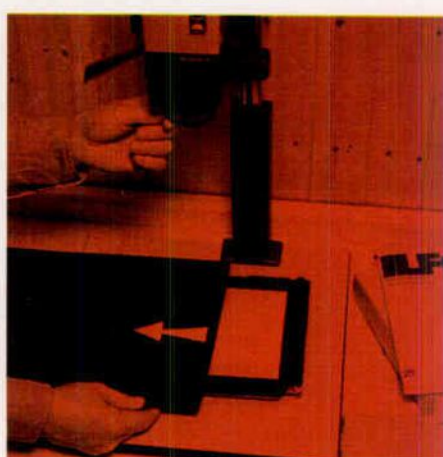
3 Close down the lens by two settings of the aperture ring. Stopping down like this reduces small focus errors and improves image sharpness



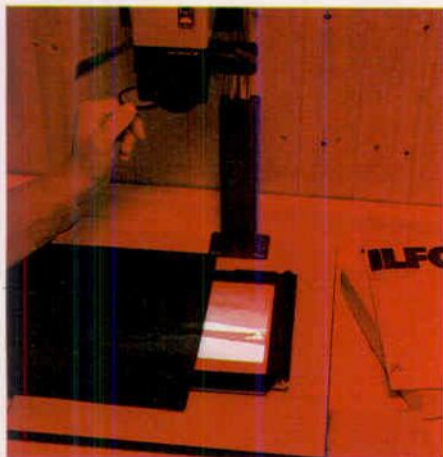
4 With dry, uncontaminated hands, carefully remove a sheet of paper from the supply packet and place this in the masking frame. You may prefer strips to prevent wastage



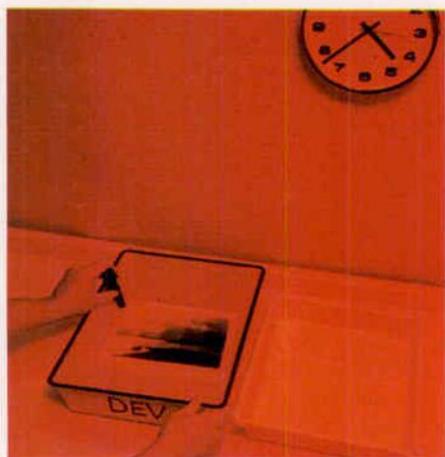
5 To make a straightforward test, use an arithmetic time progression. Start by exposing the first segment for the chosen time unit (five seconds). Time each exposure accurately



6 If your enlarger is sturdy, you can use the red swing filter to end each exposure and to observe the uncovering of the print or use the on/off switch on the lamp lead



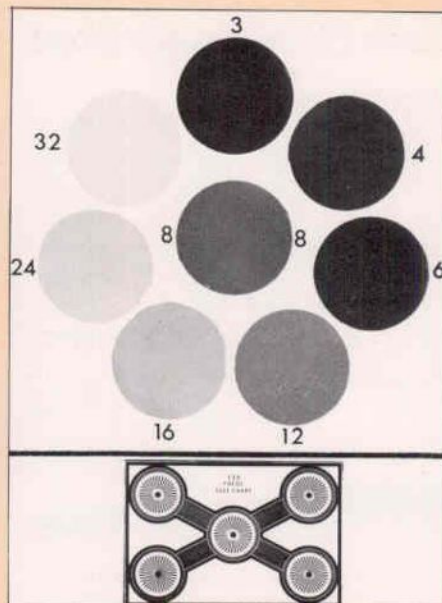
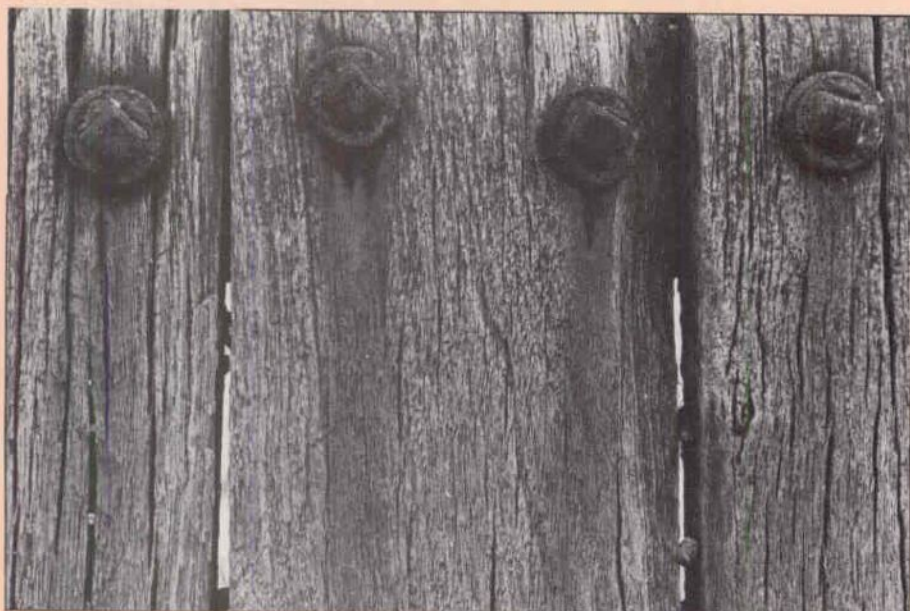
7 Expose the next segment for the chosen time (another five seconds), and continue until each of the remaining three segments has been exposed



8 Fully immerse the print in the developer. Agitate the print properly and make sure it receives full development before rinsing and fixing it



9 After a minute or so in fixer, you can inspect the print in white light and determine accurately the best time for the main print (15 seconds here)



Easy method You can buy prepared exposure test wedges. Place the test wedge (above right) on top of a piece of print paper so as to cover an even-toned part of the image. Then expose this test print for one minute (left) to determine the best time for the main print (above)

difficult to determine the length of the exposure given to each of them. For clarity, these were the exposures each segment received:

Total time for each segment (seconds)

Segments being exposed

	1	2	3	4	5
First exposure (5sec; all uncovered):	5	5	5	5	5
Second exposure (5sec; 1/5 covered):	5	10	10	10	10
Third exposure (10sec; 2/5 covered):	5	10	20	20	20
Fourth exposure (20sec; 3/5 covered):	5	10	20	40	40
Fifth exposure (40sec; 4/5 covered):	5	10	20	40	80

Following this example we obtain an exposure test strip of five steps ranging from 5 to 80 seconds. Suppose on inspection that it seems an 'ideal' exposure is between say 10 and 20 seconds: it is possible to be more precise? With a little experience it is possible to judge the exposure required if the 10 second segment is rather too light and the 20 second one a little too dark but, in case of doubt, a further test strip can be exposed covering a range of exposures between 10 and 20 seconds. This time the exposures can have the same time interval for each (*arithmetic progression*) and it is likely that three segments will be enough.

In such a case expose the whole test strip for 12 seconds, cover a third of it and give 3 seconds exposure and cover two-thirds and give another 3 seconds. The strip is thus have been given 12, 15 and 18 seconds exposure and one of these is certain to be the right one.

If you are confused by the initial geometric progression test strip (the main benefit of which is to cover as large a range of times as possible), make one where the exposure steps follow an

the brighter image on the enlarger baseboard. Then switch off.

Stop the lens down to two settings less than its maximum (widest) aperture. This covers up small errors in focusing, and gives better sharpness across the width of the image. Check that the developer temperature is correct. It must remain constant—as close to 18°C/68°F as possible—while you make both test and final prints. If the temperature does vary, the test strip may not show the correct exposure properly.

When the enlarger is set up and the dishes of developer, rinse and fixer are in place, remove a sheet (or strip) of paper from its box or packet and place it in the masking frame or easel. Make sure the test print or strip covers a representative part of the image.

What is needed is to expose the paper in segments with a progressively increasing exposure. With experience, you will be able to judge the right range, but to start with try a range of 5 to 80 seconds—change this if it is obviously wrong.

Start by exposing the whole strip for 5 seconds. Then cover a fifth of it and expose the uncovered area for another 5 seconds. Cover a further fifth and give the remaining uncovered area 10 seconds exposure. Again, cover a

further fifth of the strip, but this time give 20 seconds exposure to the remaining area. Finally, cover a further section so four-fifths of the print is covered, and give an exposure of 40 seconds. Each segment will therefore have received twice the exposure of the previous one. Even under completely unfamiliar working conditions, a range of exposure times like this is almost certain to embrace the correct one.

When you have finished remove your test print from the enlarger easel, and push it into the developer. Once it is developed, fix the test print briefly and, with the box of paper safely sealed, turn on the light. If the test is satisfactory in at least one segment (where exposure seems 'correct'), you can use this as the basis of the exposure required for the main print. If not, repeat the test using different exposure time units—longer if the test segments are all too light; shorter if they are all too dark.

A well-judged test print should show some, often all, of the five separate exposure segments. One, perhaps two, of the exposure segments may closely match the density that you think is correct for the main print.

As a test print represents an exposure variation in even increments, over five segments in our example, it is not too

arithmetic progression, but over a much broader range than that conducted for the precise times just outlined.

Select a time unit—five seconds is a good starting point for small size enlargements—and use this as the basis of an arithmetic progression.

When you make the test print or strip, uncover the first of, say, five segments and expose this for five seconds. Uncover another fifth of the print and expose this also for five seconds. Continue until each remaining segment has received an exposure of five seconds also. These are the exposures each segment received:

	Total time for each segment (seconds)				
Segment being exposed	1	2	3	4	5
First exposure (Segment 1 uncovered):	5	nil	nil	nil	nil
Second exposure (Segments 1 & 2 uncovered):	10	5	nil	nil	nil
Third exposure (Segments 1, 2, 3 uncovered):	15	10	5	nil	nil
Fourth exposure (Segments 1, 2, 3, 4 uncovered):	20	15	10	5	nil
Fifth exposure (All segments):	25	20	15	10	5

The test print therefore shows a range of 'coarse' times from 5 to 25 seconds, and one of the segments may be near to an ideal exposure if the time unit chosen is suitable for your negative. From this you can easily establish the more precise 'fine' times, over a much narrower band of exposures.

An occasional handicap of this more straightforward method is that, in certain instances, as the times increase, image density build-up becomes less and less obvious. This may reach a point where there is no perceptible difference in the density of, for example, a segment that has received a 20 second exposure, and one that has received 25.

With practical experience coarse time exposure test strips become unnecessary. Mental or written notes of coarse times applying to particular negative types and degrees of enlargement form the only necessary background to fine time tests. With further experience, there is often no need even to go to the lengths of a segment test. A guessed exposure time and a single test print exposure may be all that is required.

The easy method

The simplest way of achieving the same result is to make use of one of the proprietary step-wedge products sold

Final print The test print (p164) shows that the best time is either 15 or 20 seconds according to preference. This negative (and others like it) can now be printed with no further waste

specifically for this job. These take the form of processed film with an arrangement of differing densities, a typical one being shown on the page opposite.

The wedge is simply laid on top of the sheet of printing paper before exposing it to the projected negative image in the normal way. Most require that the print be exposed for a full 60 seconds. The lighter parts of the step-wedge permit more light to pass through them on to the paper than the darker parts and, after the test print has been developed and part fixed, you simply read off the exposure time corresponding to the step of the scale that appears to be the most satisfactory. A typical range of exposures (based on the overall 60 second exposure) is: 2, 3, 4, 6, 8, 12, 16, 24, 32 and 48 seconds.

For fine times, the overall exposure is reduced to convenient fractions. With a 30 second exposure, the indicated times can be halved, and so forth.

These items are inexpensive and convenient. They are not, however, capable of giving highly accurate fine times as easily as is possible when you adopt the standard methods of producing test prints, and it is sometimes difficult to get the step-wedge to straddle a representative part of the print image.

Making the test count

Use a full sheet of paper for exposure segment tests when you first start to make test prints. This however does tend to be uneconomical. Small off-cuts or pieces can provide just the same information and are less expensive.

With both, however, much the same problem exists—that of ensuring a representative area of the image appears in each exposure segment. If such an area does not appear in each, the correct test print exposure may not give a correctly exposed print.

To illustrate this point, take a typical shot where such a fault may occur—a

typical landscape where sky and land form half each of the image depth. A test print produced with horizontal segments results in two exposure segments covering the sky area only, and two covering the land area only. No segment is truly representative of the whole picture.

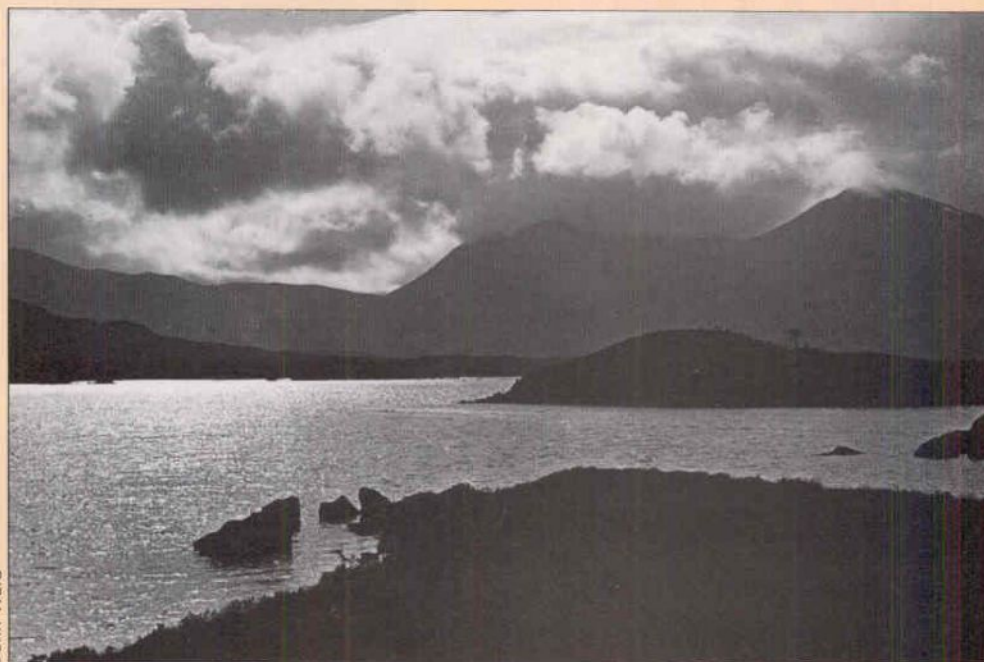
But if vertical segment strips are used, almost every segment caters for both land and sky areas of the image. And not only do we obtain a segment that provides a useful compromise in respect of the reproduction of both sky and land, but we can also see at a glance which time is best just for the land and which is best just for the sky—two points of information that can be used at a later stage for local manipulation of print exposure. For the time being, however, a compromise can be established if necessary.

For any negative there are lighter and darker parts, the former requiring less exposure than the latter. For generally distributed and small areas of each, one general test strip is usually sufficient. Where one area becomes segregated from another, make sure you include both in the same test strip segment.

With very large images, the physical size of the image itself makes it necessary to use two separate test prints—one for the darkest parts of the image, another for the lightest parts. Both should be processed together.

In short, provided commonsense is applied, test prints save time and money, for you only need to expose the test print to a representative region of the projected image for the information to hold good. And, with extreme enlargements you need only use a small off-cut of paper for your test print.

If the test proves that things are not going quite the way you thought then make another test print to help you finally decide what exposure gives the 'spot on' enlargement you are after.



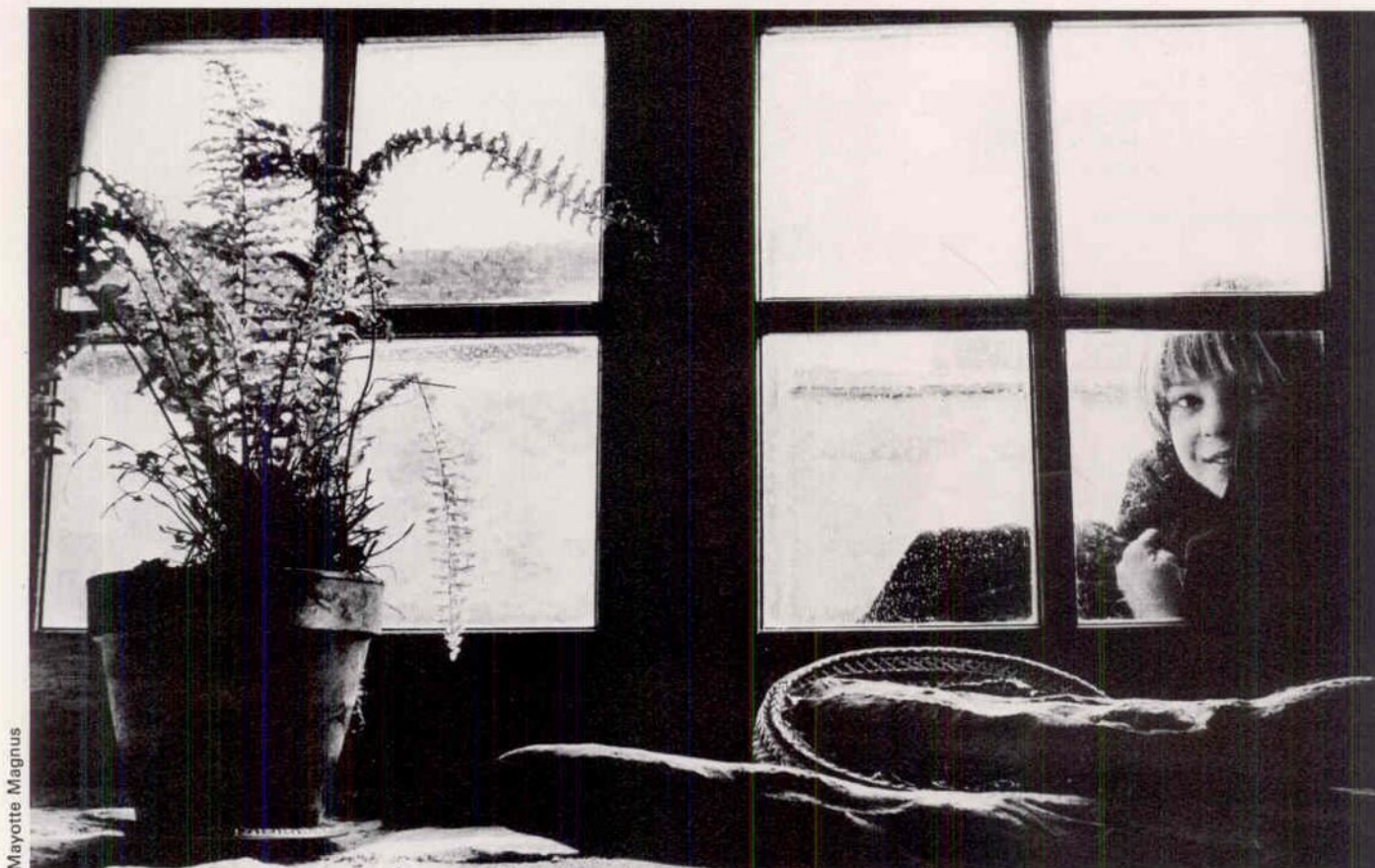
John Ward



Creative approach

Portraits outdoors

Nearly everyone takes photographs of family and friends from time to time, but most photographers have a rather casual approach to the subject. A little thought and careful planning can improve your portraits dramatically



Mayotte Magnus

Taking someone's portrait is, perhaps, the most personal of all photographic assignments, and portraits are probably the most treasured of all photographs. Millions of wallets, walls, desks and mantelpieces the world over are adorned with pictures of faces which are loved and cherished.

But the magic of creating a photo that instantly captures the look and personality of a friend or relative has very little to do with cameras and equipment. Successful portraiture—recording and preserving the likeness of someone—depends as much on the photographer seeing and shooting at the right time and in the right place.

The best advice for any photographer wanting to succeed in revealing a flattering yet recognizable likeness of a friend or relative on film is to think about your subject before the session.

Bronzed Strong sunlight brings out the rich gold of the suntanned skin but the face is kept in shadow to avoid harsh and unflattering modelling



Looking in The child's face glows against the dark window surround and warmly wrapped coat and peeps appealingly into the corner of the frame

What are the pleasing or outstanding characteristics about him or her, and how could you successfully translate them onto film?

The best place to start taking portraits is outdoors. The light is far brighter than indoors, offering a wide choice of possibilities ranging from the strong harsh sunlight on the beach to the deep shadow of the woodland floor on a rainy day. The number of potential settings is also enormous—gardens, shopping arcades, mountains, fields and so on. And taking portraits outdoors can often be spontaneous. You might decide to take a friend's portrait on the spur of the moment, while walking across the park, for instance.

Spontaneity can be vital because in a formal situation people tend to become self-conscious and expressions become forced. Most people are terribly anxious

Ingolf Thiel/Image Bank

and shy about having their photograph taken, and may be apprehensive about the finished result.

Until your subject is relaxed, it can be difficult to get a good portrait. The art is to make the session an enjoyable event for both subject and photographer. If it all feels like a chore, that is how the results will look. Be prepared to use a lot of film on the session, letting the subject get used to the camera and waiting for the right expression.

Talk to your subject. Tell jokes. If you want a relaxed atmosphere, you have to be at ease yourself. Confidence and a friendly manner are an essential part of achieving good portraits. You will probably need practice before you can relax and take control because, unlike your subject, you will be doing two things at once—talking and trying to take the shot.

Portraiture essentially involves two people, the photographer and subject, and it is normally expected that the

Dimitri Kasterine/Daily Telegraph Colour Library



Old man A man portrayed against a background of the work that occupies over half his life. The rough texture of the skin encouraged a close up

photographer should take the initiative. Unless your subject is a professional model or actor, it is not enough to simply place him or her in front of the camera and press the shutter. You have to direct your subject in the nicest and friendliest possible way.

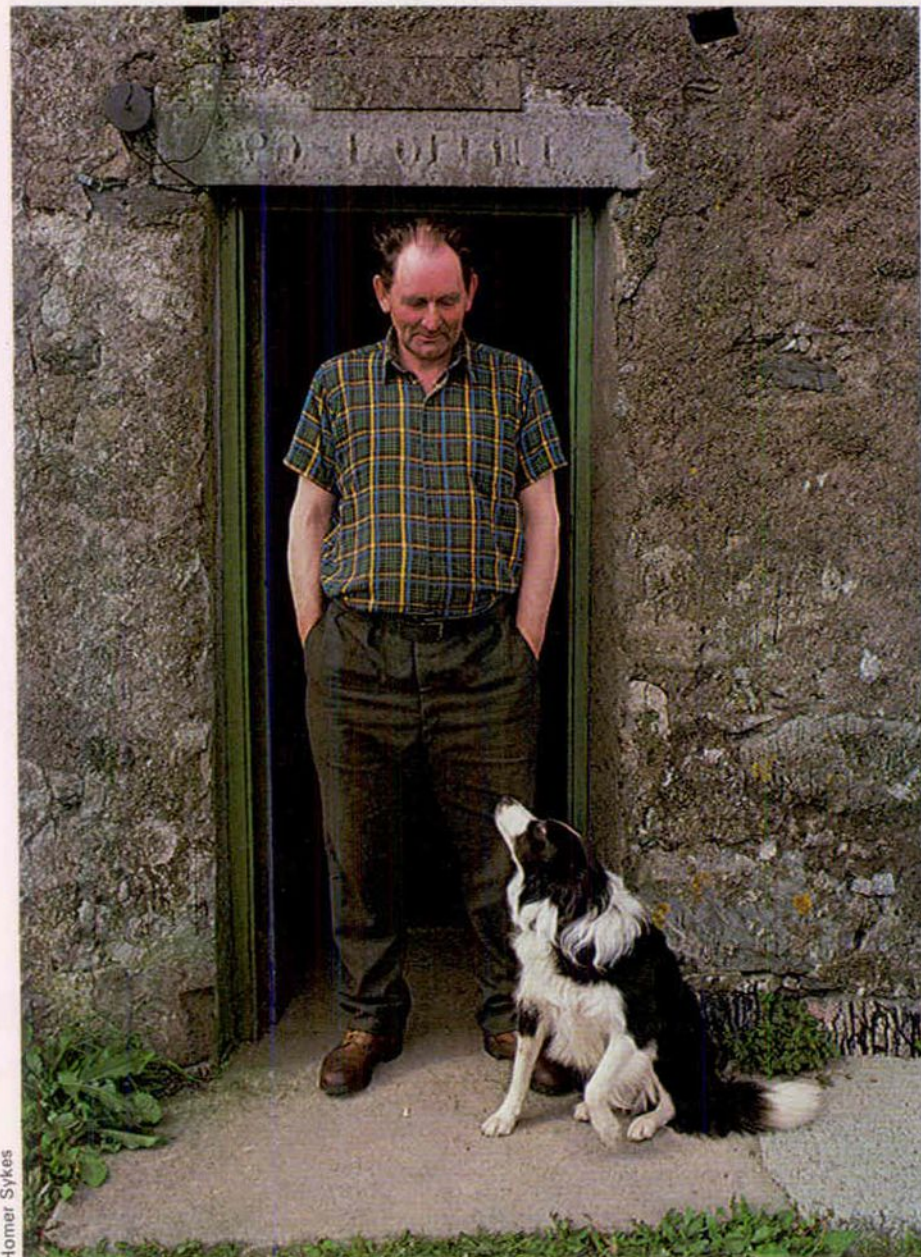
Overdirecting, however, can be worse than not directing at all. If you force your subject into a pose, he will resent it and feel like a helpless puppet and ill-at-ease. It will also almost certainly produce a 'stuffed portrait'. On the other hand, it is not enough to just say 'smile' and hope for the best.

The happy medium, wherever possible, is to make your subject feel that he or she is a valuable part of the creative process. Get him to take a positive part in the session and suggest new poses. These may be more natural to him. He may feel awkward standing up, for instance, and lean against a wall or sit down to make himself comfortable. Unless you have positive reasons for the upright pose, you should encourage changes of position.

Many people become very self-conscious about their hands when sitting for a portrait and you should always suggest to your subject what to do with them. You might, for instance, want a casual impression and might suggest that his hands go in his pockets. Or you could give him something to hold.

But remember that hands can contribute to the composition. Hands are a very important means of expression and may draw attention to some feature of character that would be missed, or hard

Man and his dog Animals can say a lot about personality. The mutual respect and affection clear in this picture suggest a gentle but strong willed man



Homer Sykes

Jon Danzig



ever, in which case you want to find the angle that obscures the less attractive or weaker parts of the face. A broad face, particularly a broad chin, can be made to look narrower by shooting from a high angle and getting the subject to tilt his or her chin away from the camera. A weak chin, on the other hand, can be made to look stronger by shooting slightly upwards from a low angle.

As well as thinking carefully about your subject you will need to consider the setting. Ideally, the background should relate in some way to your subject. What should be avoided are backgrounds which dominate by being too strong or intricate. The idea is that the setting should complement and enhance the subject.

Mood can be accentuated with lighting and outdoors there are many ways light can be used creatively.

The best all-round illumination for photographing people is evenly diffused light—soft, flattering shadows can be produced with the filtered, hazy light of a misty morning or in a shaded setting, such as in a wood or under a tree. Bright cloudy days are particularly good. In addition, subjects often feel more comfortable in this sort of lighting than they do in direct sunlight, which can make them squint.

However, soft light may sometimes hide the very character lines you wish to bring out. Unless you want to hide their wrinkles, weather-beaten faces need strong direct light to bring out the rich skin texture.

The point to remember is that you are responsible for whatever is in the frame of your camera. Look at it carefully, and especially train yourself to be aware of distractions, such as a lamp post coming

Johnny Morris *Hands can be a problem in portraits, but they were kept nicely occupied for this picture to provide a relaxed and informal portrait*

to show, in a simply facial portrait. A thoughtful person, for instance, might rest his chin on his hand. An ebullient person may place his hands definitely on his knees when sitting or on his waist when standing. Cupped or open hands can sometimes suggest vulnerability. However the hands are used, though, they should look part of your subject's natural repertoire of hand movements.

Thinking about your subject and looking for his or her best attributes will help you to decide how to take the photo. If he or she has attractive eyes, for instance, close in on the face. The wrinkled faces of some older people may be so fascinating that a close-up of the face alone provides a strong and interesting image.

Many photographers are unsure how to approach close-ups. Should the subject look at the camera obliquely or stare straight into the camera? Or should he not look at the camera at all?

Most people nowadays tend to prefer an oblique shot, often with the head

slightly tilted, because this seems more natural and unforced. A head-on approach, on the other hand, although it often seems horribly formal, can produce striking portraits of forceful characters. Shots like this can be very direct, and even intimidating, to the viewer. Whatever approach you choose, however, it should be appropriate to the person you are trying to portray.

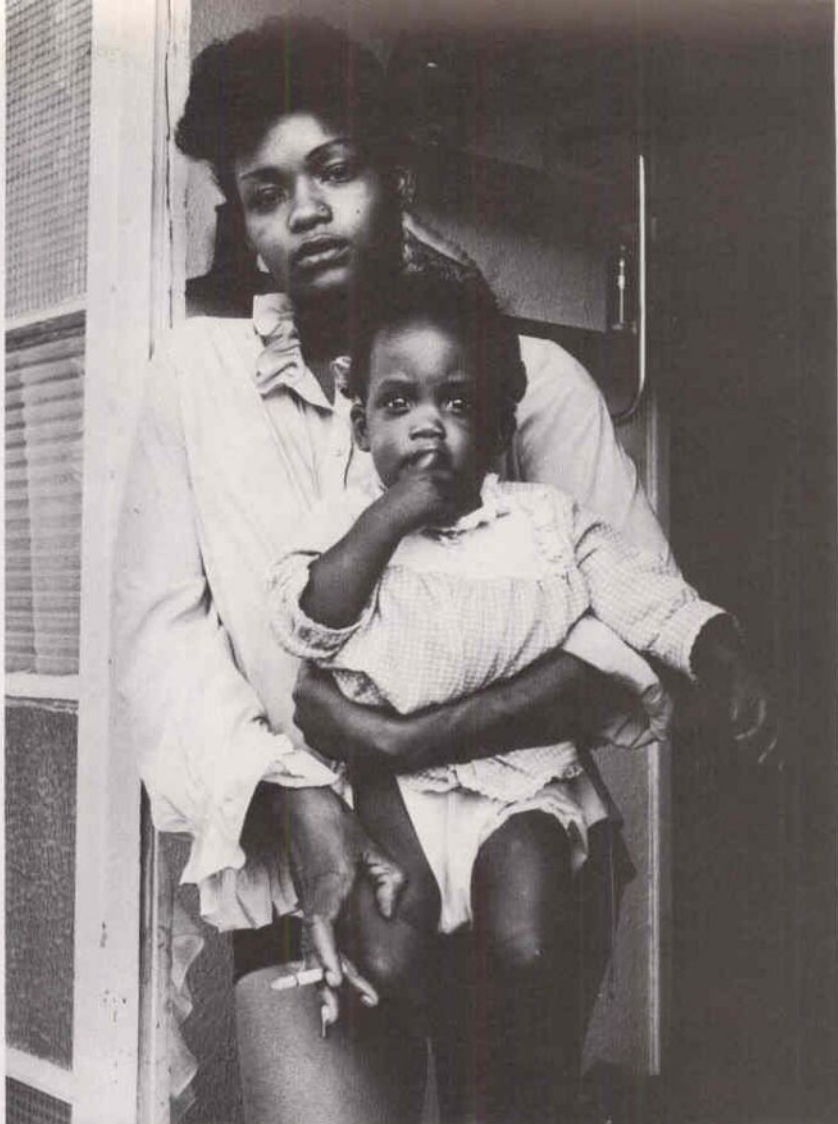
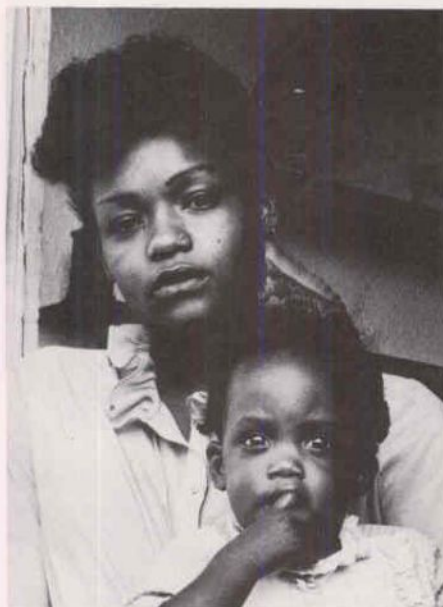
If you move round to shoot from an angle, beware of going too far. Too sharp an angle can lose you all the detail and information on one side of the face. Because of this, profiles rarely work for portraits, though they can make fascinating abstracts. A profile shot is generally only successful when the subject has very distinctive features.

Your aim might be to take a photo that particularly flatters your subject, how-

Artur Rubinstein *This charming portrait of a famous musician shows that a successful picture does not need an obvious musical background*



Mayotte Magnus



Michael Birt

Full-length or close-up? Three different crops of the same photograph show how the format can considerably alter the impression conveyed by the picture. All three versions are strong shots, but all say something entirely different about the personality of the

subject. The close-up is a striking portrait of an attractive woman. The shot below shows her as a mother with her child. But it needs the three-quarter length shot to show her as she really is and how she lives, through the clues of her stance and her surroundings

out of your subject's head or a strand of hair that has cast an ugly shadow.

Although good portraits can be taken on virtually any equipment, there is something to be said for choosing a lens to suit the type of shot you have in mind. For head-and-shoulders shots, an 85-120 mm zoom, or a fixed focal length telephoto within the same range, are probably best because you have to stand farther back than you would with the standard lens. This reduces the chances of distortion of features close to the camera—close-ups with a standard lens can often produce huge noses or overprominent chins. Another advantage with long lenses for close-up work is that you subdue sharp, overdistinct features flatteringly. Remember, though, that this could work against you if the subject has very shallow features. One

Girl in a straw Hat Diffuse lighting is ideal for romantic portraits of young girls. Here the straw hat both softens the light and frames the face



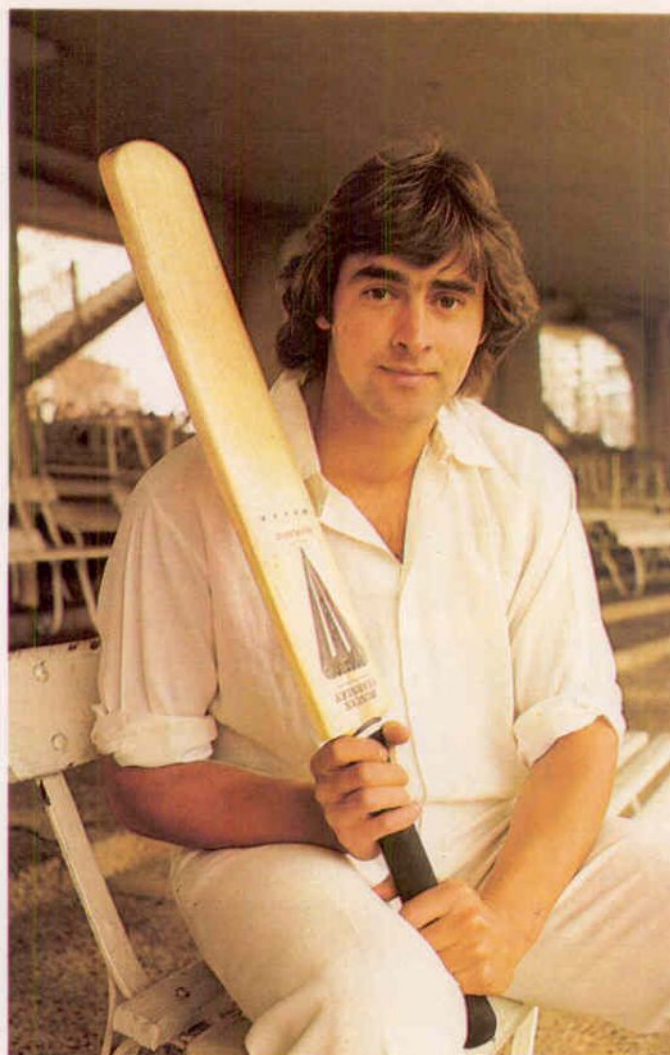
G. Baudier/fotogram



Mayotte Magnus

Unusual viewpoint Changing the angle of your shots can produce dramatic changes in mood. These can be particularly effective in black and white; this shot might well look weak in colour

Cricketer One of the best ways to portray people is to catch them at their favourite activity or in their working environment. Here a cricketer's bat is a useful prop and a sign of his trade



Clay Perry



Hoyer: Snowden/Vision International

final point in favour of a short telephoto is that the comparatively narrow depth of field allows you to keep the background blurred more easily.

With half- or full-length shots, however, it is probably better to retain your standard lens. You may even wish to use a wide angle lens for these shots for special effects. A short person can look very tall if photographed from a low angle with a wide angle lens. And even with close-ups you may be able to use a short focal length lens to create a dynamic and moody impression, but with this sort of shot you must choose your viewpoint carefully or the result could be bizarre.

But whatever equipment you use, the success of your portraits depends ultimately upon your relationship with your subject and the confidence that comes from experience and a keen interest in the people that you portray.

Happy couple Shots like this depend less on careful posing than establishing a rapport with your subject. It is virtually impossible to fake laughter

Hair colouring The success of such a portrait depends entirely on capturing the arresting hair style and dress and minimizing background distractions



Junior football

Covering a football match or any other sporting event can be a rewarding assignment. This holds true at all levels, as sports photographer Peter Robinson found out

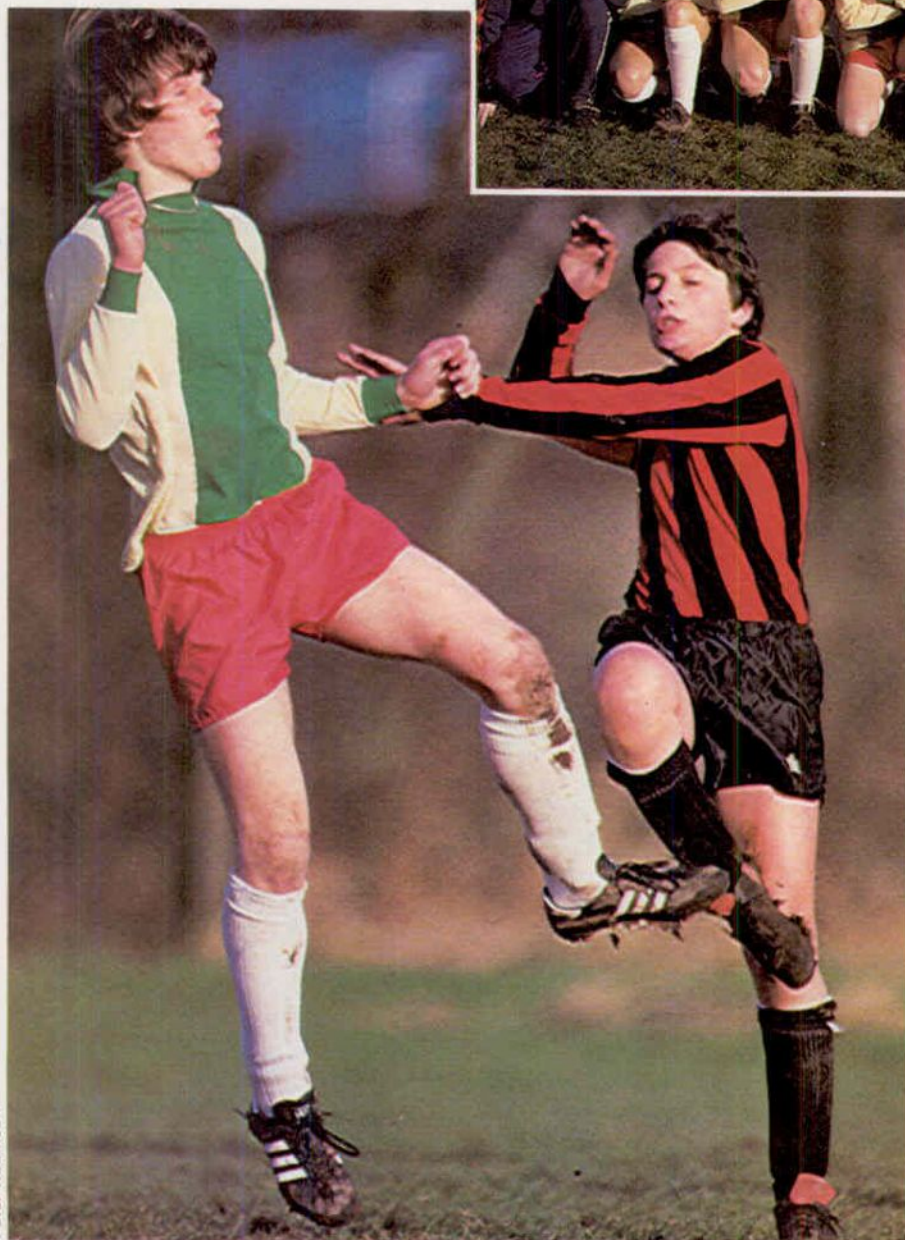
During the soccer season there are numerous opportunities for shooting a series of photographs of the game. Not many amateurs have the chance to photograph league football as they would wish, but even at junior level you can get some dramatic shots and you can benefit from being able to get a clearer view of the action. There are less spectators and you can stand closer to the touch line than at a professional game so your close-up shots are likely to be far more revealing of the individual players when at an amateur match.

Peter Robinson approached the



Team photo The standard pre-match line up with six players standing and the others kneeling in front of them

Going for the ball Action shots like this need keen anticipation to frame the players as they lunge for the ball



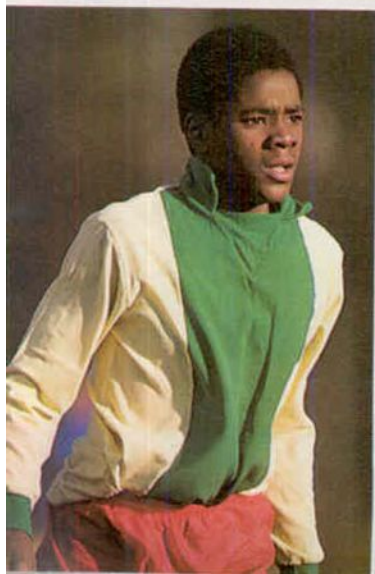
subject as if he were covering a major soccer match and used the techniques he has learned over the years:

'Although it sounds obvious, it is essential to get a good viewpoint at these events. Many people can never decide where to stand to get the best action shots so they end up running around trying different viewpoints and miss good opportunities. It is vital to organize yourself properly and to stand in the right places at the right times so that you don't miss out on the most exciting moments.'

For these shots Peter stood half way down the touch line so that he had a full view of both ends of the field. From this spot he was able to capture most of the action with a 400 mm lens on one of his 35 mm bodies. Using this lens he managed to fill the frame while isolating unwanted background details. However, there are things to watch out for in choosing this position:

'I had to be careful to stay out of the linesman's way so that I didn't block his path or find him standing in front of me

At the match Although the action was on the field, there was just as much tension on the touchline and Peter also snapped candid shots of spectators and players at half time





Anxious moment Even on the field, there are plenty of interesting shots to be had away from the heart of the action

Perils of the keeper A sequence of shots can often tell a fuller story than a single picture

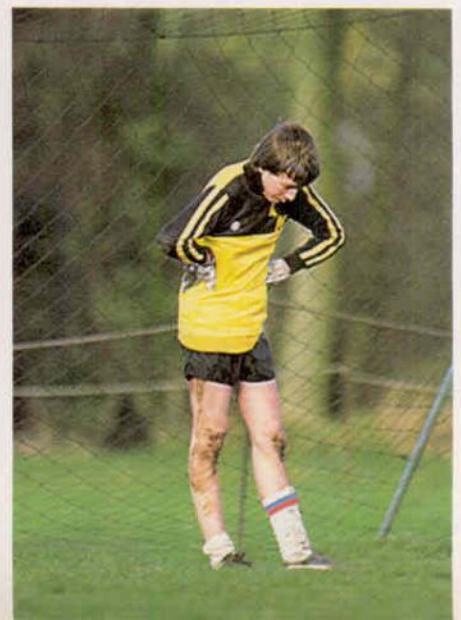
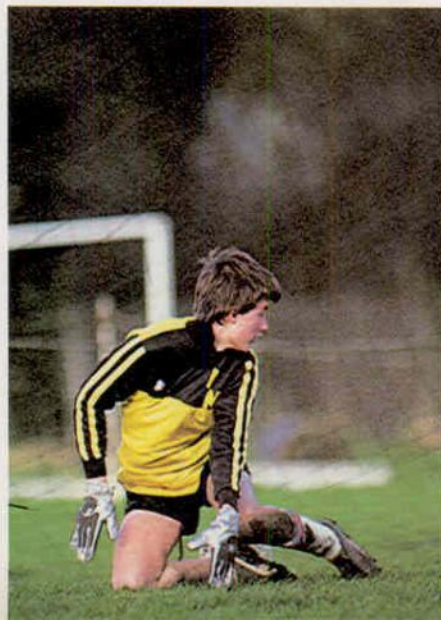
when I was trying to get a shot. This position is also awkward if the action is confined mainly to one end of the field. Whether or not you move up and concentrate on one end of the pitch depends on the way the game is going. If you do this you will need a lens of about 200 mm and you run the risk of missing any action which suddenly moves down to the other end.'

Another good position for action shots is behind one of the goal nets. This is a favourite for Peter. Using a wide angle lens from a low angle he often manages to get exciting shots of an attack on the goal, or the goalkeeper desperately trying to save the ball.

'It is not a good idea to limit yourself to just one position, though. I tried different viewpoints during the course of the match, but you must be careful to pick the best moments to make the change. It was important to try and anticipate where and when the action was going to take place. If the goalkeeper was kicking the ball forwards, I tried to guess where it would land so I could focus on that spot. By doing this I was ready for any players who jumped up to try and head the ball.'

Although action shots are certainly the central interest, there are many other aspects of the match to focus the camera on. Peter asked the coach to arrange for a team photograph before the match and looked around during the match to see what the spectators were doing. This way he caught a few nice candid moments. Shots of individual players as they were watching for the ball made fascinating subjects and managed to capture some of their expressions. In the end, though, it is the action shots which are the most important for a series of soccer photographs and Peter concentrated on getting a range of these, but shooting a soccer match has its drawbacks.

'The photographer sees a soccer match in an entirely different way from the average spectator. For me it was a series of incidents seen through my viewfinder. I was never involved with the match as a whole and I don't even know who won!'





Creative approach

Nudes indoors

The nude has been a favourite subject ever since the first images—whether drawn or photographed—were created. For many people, getting started is the biggest problem

Over the past couple of decades, an aura of glamour has grown up around the professional photography of naked men and women that makes this field seem highly attractive but at the same time unobtainable to the vast majority. Most photographers are aware of the photogenic possibilities of the nude, but few ever explore them. Yet given confidence, and a little luck, there is every chance that you can tackle this subject with the same success as any more accessible subjects.

The biggest problem is finding a model. Some people suggest that a good photographer can make any model look good. While this may have been true once, the constant exposure to pictures of beautiful men and women in the media has raised people's expectations and it now may be truer to say that a photographer can make any model look bad. So before you take any nude photograph you must be confident that your model looks good. If you have doubts, you may undermine your subject's confidence and this will almost certainly ruin your chances of success.

Professional agencies are certainly one of the best sources of models. Professional models are used to posing, and should have few inhibitions. They may also be able to help contribute positively to the session since the most experienced will already have a very good idea of what sort of poses look good and what angles show them off to the best effect. Such agencies can be found in most large towns and most will have at least one model to suit your taste.

Unfortunately, you may have some difficulty arranging a session with a professional model. The agency has to be given precise details of the session you have in mind and must be convinced of the quality and integrity of your work. More importantly, hiring a professional model for even a short session can be very expensive. If you know you can sell the pictures afterwards, the expense may be justified, but most photographers have to look elsewhere.

Camera clubs are one source. Most local clubs have regular nude sessions when a model hired by the club poses for the members. The results are rarely satisfying since it is difficult for the individual photographer to arrange poses but these sessions can make a

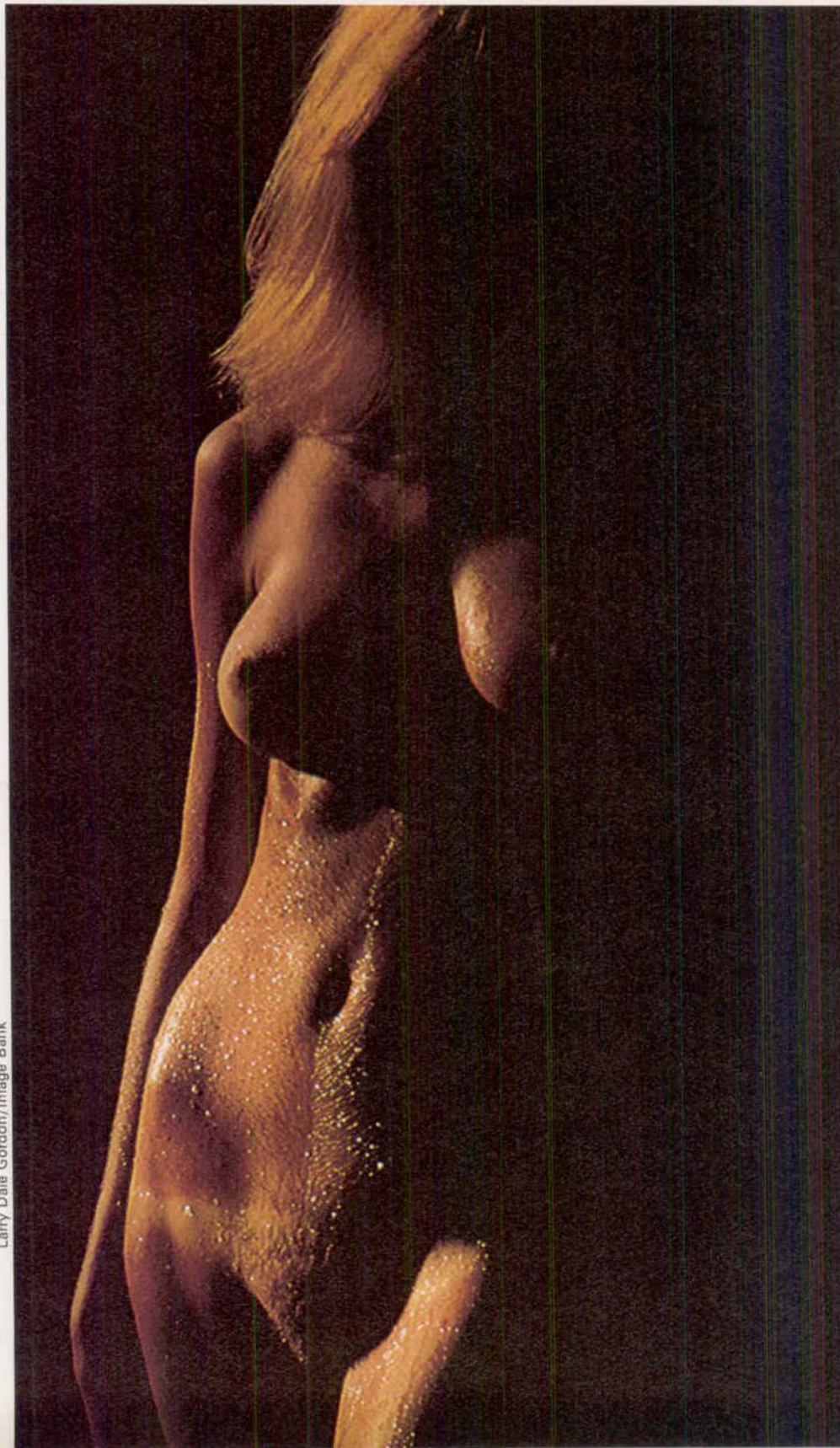


Figure study A thin shaft of sunlight in a room is ideal for this type of study, with deep shadows and dramatic highlights for a sense of mystery

Larry Dale Gordon/Image Bank

useful starting point. They help you get used to the idea of pointing your camera at a naked body and give you some insight into the photographic potential of various viewpoints.

Nevertheless, there is no doubt that you will eventually want a private session if you are to discover the creative possibilities of nude photography. If you find professional agencies prohibitively expensive, then you might try the life classes at the local art school. Although the models are not necessarily as glamorous, rates are usually less than professional models and the models will often undertake a private session if approached politely and tactfully.

You may find a suitable model among friends and relations and some people may be only too flattered at the suggestion of a nude session. However, most will feel shy or inhibited or may feel that they are not sufficiently photogenic. You must broach the question delicately and convince them that your photographs will show how attractive they really are. It may be that their very selfconsciousness will give the final photograph a natural

look impossible with a confident professional model.

Finally, you may be able to ask a total stranger whose exceptional looks attract you. Approaching strangers, though, requires considerable self-confidence and tact, and you must be sure that you can convince them of the honesty of your intentions and the potential success of the session. In this respect it almost certainly helps to have a portfolio of your best work compiled to show them.

Once you have a model, you must arrange a location for the session. Many people tend to think that a large purpose built studio with expensive lighting systems is essential, but pleasing results can be achieved just as readily in an ordinary room using simply the available daylight. The diffuse illumination streaming through a window on a bright cloudy day produces a soft light which brings out all the contours of the body but produces no harsh shadows. And the clear white light gives natural and clear skin tones without showing up unsightly blemishes.

One of the most important requirements for your location is privacy. While a professional model may be used to the occasional interested observer, someone who has never modelled nude before will almost certainly be embarrassed by sightseers. You too are probably nervous enough on this sort of session without the additional pressure of an audience.

Although it depends on the sort of pictures you want—moody atmospheric shots need low light levels, for instance—you generally need a room with plenty of light. So when you choose your location look for a room with large windows and look through the windows to ensure that they are not overshadowed

Kneeling A classic pose—a kneeling model with her hands in her hair. The pose is natural and comfortable and the raised arms help to uplift the breasts

Looking Another approach to nude photography—the man's pose is natural and relaxed yet makes full use of the potential that the nude body offers

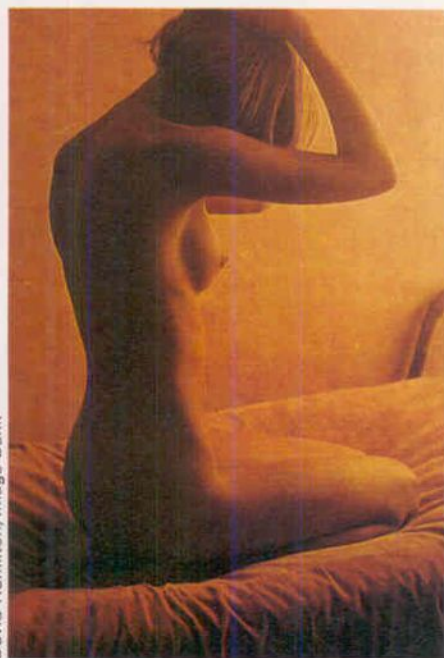


After bathing Droplets of water help to bring out the texture of the skin and emphasize modelling, adding a touch of sensuality and glamour to the shot

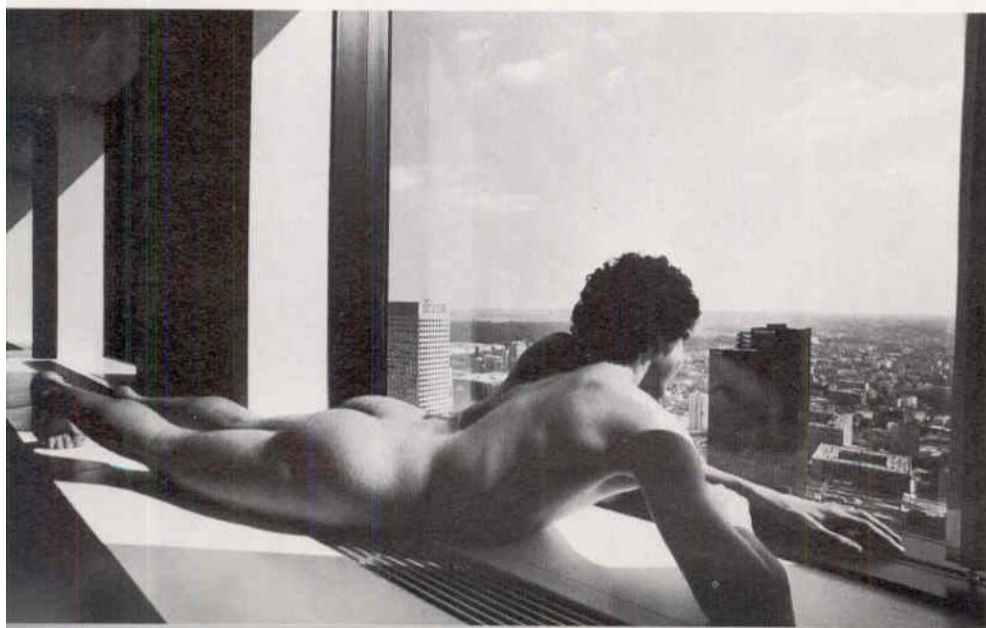
by trees or adjoining houses. Upper floors are generally better, particularly as they are less easily overlooked, and north facing windows in the northern hemisphere (south facing in the southern hemisphere) always give a soft diffuse light. But remember that the nature of the window can dictate the atmosphere of the picture. A gothic casement window throws an entirely different light on the subject than a modern picture window.

A high window can be restricting because if the subject is reclining, he or she will only be lit from above, while if standing, the feet may be completely in shadow. While this may help you produce beautifully atmospheric shots, it is usually better to find a room where the window sills are very low. Victorian sash cord windows are often good in this respect, but French windows and even conservatories are better still, providing there are few distractions.

Many photographers use the window as the basis of the photograph. One of the most common, and often most pleasing, ways to photograph a nude—particularly a woman—is to stand her at the side of a window gazing wistfully out. There she will be well illuminated by light from the window but she will stand out from the dark area of wall either side of the window—the darkest part of the room. If the light is too harsh, a lace or net curtain over the window should soften it and will often produce an attractive shadow pattern on the girl's body which enhances all the curves and contours. Here a half or three-quarter length shot, suggestive but not too revealing, may be very romantic.



David Hamilton/Image Bank



Lucien Clergue



Michael Birt



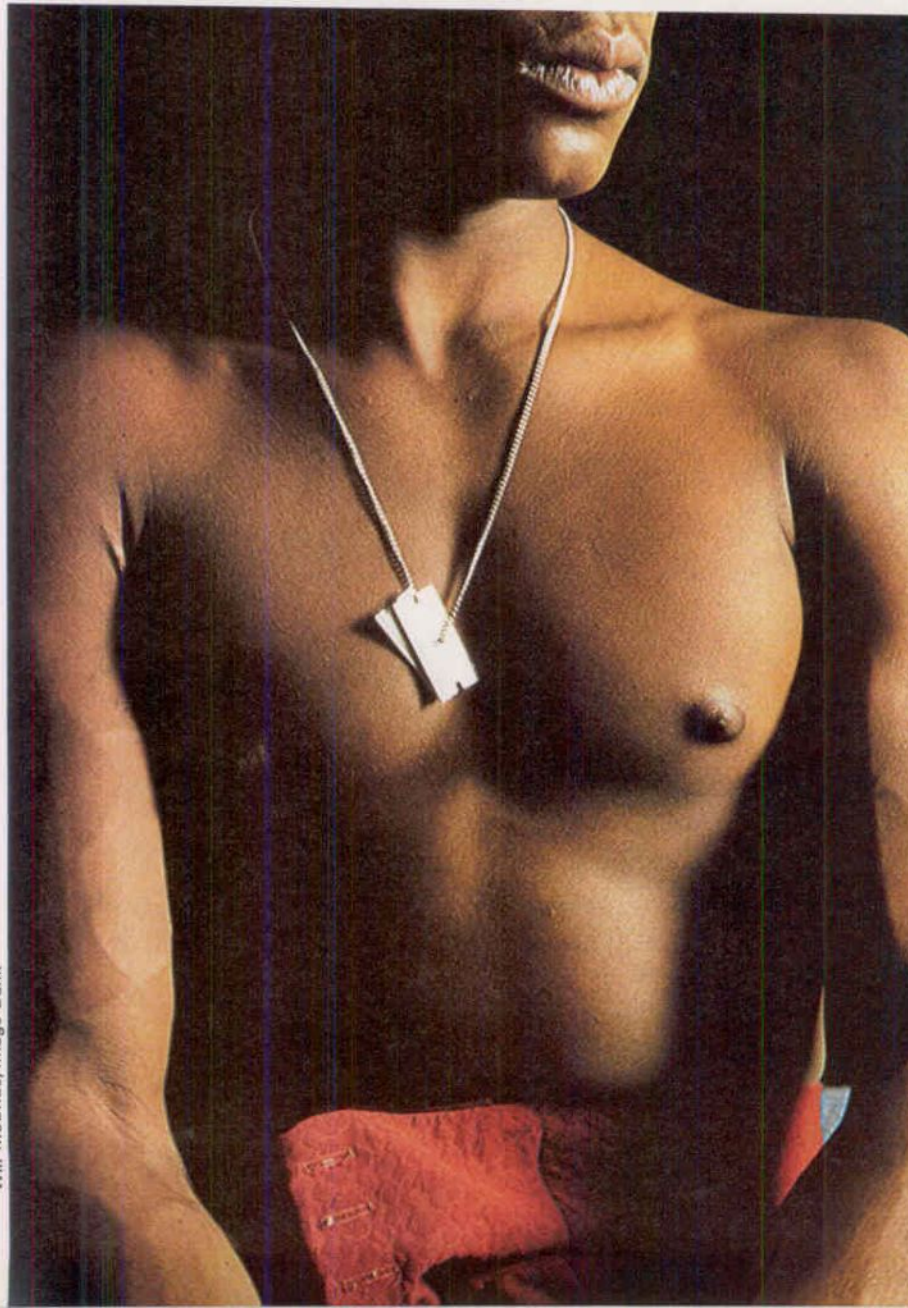
Oriental girl *The model's origins offer an obvious but quite effective cue to the background. Notice how the arched back and pointed toes add grace*

Torso *Male nudes often benefit from strong sidelighting: it makes the main features of the body look solid and emphasizes skin texture*

The decor of the room must depend largely on the type of photograph you want to take. It is useful, though, to have white or pale walls which can reflect light and fill in shadows, but the colour should contrast with the skin tone of your model. A deep sun tan glows against bright white walls while fair skin is lost against a pale pink or cream wall. Similarly a rough textured wall often enhances the smoothness of the skin.

Whatever type of room you choose, the background should usually be kept simple. Soft drapes and cushions are very popular with glamour photographers. The advantage of drapes is that they are easy to use. You can change the colours and arrangements very easily to suit your picture while still providing a clean but interesting background. The curves and folds suggest sensuality while the use of drapes and cushions conveys a sense of the luxurious and the association with bedclothes adds a hint of eroticism. All of these help to glamorize the shot.

But there are many other possibilities for nude photography apart from the obvious glamour shots. You may wish to convey something of your model's personality, in which case a bedroom full of their personal belongings and decorated to their taste might provide a suitable location. You may wish to show an innocent and natural-looking girl against the decay and barrenness of a derelict house—both stripped and laid



Will McBride/Image Bank



Close-up Moving in close can give almost abstract results, enhanced here by the shadows from the blind, but curves and colouring help to retain sensuality



Verdant cityscape The nude need not be the dominant element in the shot. Here the nude is merely part of a visual statement made by the picture

bare but in entirely different ways. These sort of pictures often have an indescribable sense of wistfulness which may be enhanced by the soft light in such houses. Or you may wish to contrast the rounded beauty of the girl with the straight hard lines of modern buildings and furniture. The possibilities are endless.

Many photographers nowadays bring a touch of off-beat humour into their picture by photographing nudes in incongruous locations or with somewhat bizarre props. A girl wearing only dark glasses, long black gloves and fish-net stockings may thus be posed against a standard office desk.

Before you start shooting, you should have a very clear idea of precisely the type of shot you are looking for. Try and plan every shot carefully before the session so that you can direct your model from pose to pose with total confidence. Some professionals write up a detailed shooting schedule before a session so that they waste the minimum of time moving between shots and can project an image of complete control. Of course, you may fit impromptu shots into the session very successfully—many attractive candid shots have been shot in the resting period between poses—but it is essential to have a clear idea of what you want before the session.

The relationship between photographer and model during the session is an essential part of the photograph. Both photographer and model need to be at ease with each other—any tension will usually ruin the chances of your pictures looking natural and unforced. Remember that undressed, most people feel exceptionally vulnerable. You must go

out of your way to reassure your model and build up their confidence. Involve them in the creative process. Explain the sort of pictures you are looking for and get them to suggest ways of creating the effect you want. And make sure that they are physically comfortable. A cold model is unlikely to be cooperative and may be covered in unsightly goose-pimples.

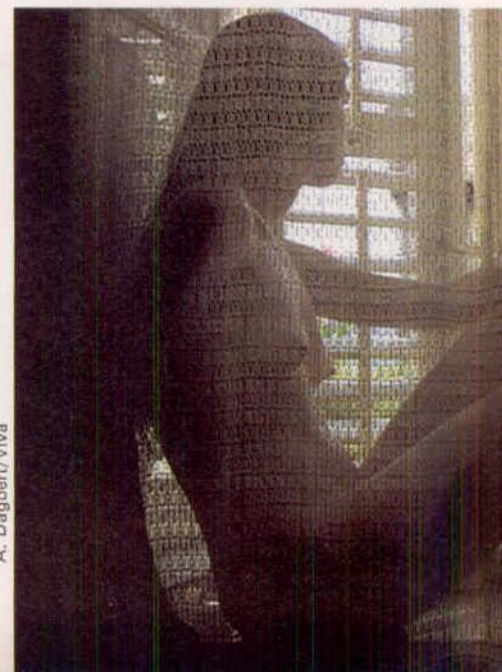
Look at a series of professional nude photographs of girls and you will find that in most, the model is wearing make up. Although in certain circumstances a natural unmade up look may be very attractive, even the best looking models can look pale and uninteresting in a photograph without make up. Sometimes it may be necessary to apply make up to the whole body, but generally just a little subtly applied to the face by the model will suffice.

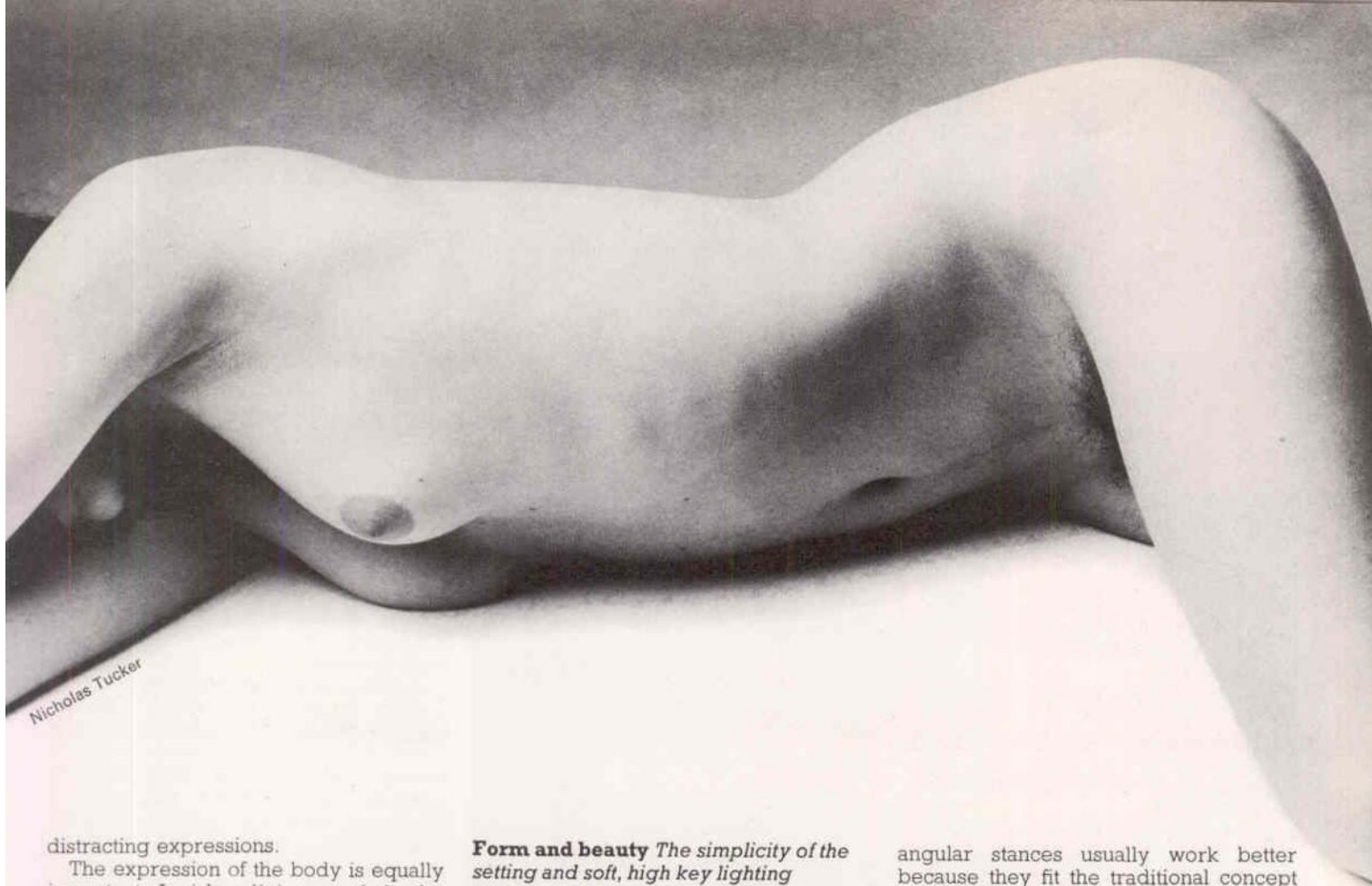
Immediately before you start shooting your model should be wearing a loose dressing gown or towel. Any tight clothing tends to leave unsightly marks on the body which take a long time to disappear, especially in cold weather. A gown can also be slipped off easily and gradually without any fuss that might increase the model's self-consciousness.

With an inexperienced model, it may be worthwhile starting the session with the model still wearing the gown. You could perhaps start shooting close-ups of the shoulder and neck. The curve of the upper arm, the cleft under the arm and the deep hollow between the collar bone, and the slope of the neck all have wonderful photogenic possibilities. Go in close and move around to take advantage of light and shadow playing

upon these areas. Not only will this help give you confidence but it can produce some beautiful pictures.

Again, the type of pose you ask for must depend upon the type of photograph you want. Unless you want an entirely abstract shot, the model's expression, both in the body and face, are important. The difference between a tasteful nude and a pin-up often lies in the facial expression. A model whose head or body is turned slightly away from the camera but whose eyes are staring directly at the camera tends to look the provocative and inviting pin-up; the tasteful nude does not appear to play up to the camera so much. In fact, many photographers try to exclude the face from the shot to avoid awkward and





Nicholas Tucker

distracting expressions.

The expression of the body is equally important. A girl reclining nonchalantly, especially if she is looking towards the camera, appears confident or even brash, while a girl kneeling on the floor with her hands in front and her head down looks shy and vulnerable. These expressions have different connotations with men, however, and you should experiment to see how various approaches appear in the final photograph.

Whatever expression you try to coax from your model, it should ideally convey something about personality. A quiet, thoughtful girl might be posed sitting at a table gazing wistfully into a mirror or at a letter, or leaning against

Form and beauty *The simplicity of the setting and soft, high key lighting combine with an elegant pose to show the grace and beauty of the human form*

the window staring out into space. A lively action shot might suit a vivacious effervescent girl better. And a tall, elegant girl might be approached delicately from a distance with a shot that emphasizes the grace of her body without ever being too revealing.

Many amateurs are at a loss whether to pose their models standing up, sitting, reclining on a couch, lying back or whatever. There is no hard and fast answer and it depends on the personality of the model, but there is no doubt that it is easiest to begin with the model in a fairly relaxed position. Sitting or kneeling on a couch or the floor is probably the best place. Standing up or lying down the model may feel very vulnerable and self-conscious and it is well to avoid this sort of shot until you have their confidence.

Nevertheless, curvaceous poses generally look better with girls than a stark, angular stance. When standing, a bend at the waist helps to emphasize the narrowness of the waist and the curve of the hips. When reclining, one leg drawn up tends to enhance the form of the body, while bending knees and elbows helps to stretch out any wrinkles and keep the skin smooth.

With men, however, related poses do not always look right. Deliberate and

angular stances usually work better because they fit the traditional concept of masculinity better.

Whatever position you shoot from the body rarely looks good if slouched up because this emphasizes the folds and creases in the skin. If you are shooting a girl, for instance, from in front of the body, get her to arch her back to stretch the stomach. And get her to raise her arms to lift up the breasts.

Use the available light to emphasize the features you want to show. If you are shooting with the window behind you and the light falls flat on your model's face and body, all skin texture disappears and body features tend to be flattened. With your model standing directly between you and the window you can get attractive back lighting which softens the outlines though you may have to use a reflector to fill in shadow detail.

Side lighting brings out the texture of the skin and the contours of the body but again you may have to use a reflector to fill in shadow detail. Shots of the back can be rather dull unless you have good strong side lighting to emphasize the ridge of the spine, the hollow of the shoulders and the cleft at the top of the buttocks. Strong sidelighting is particularly good for male nudes since it makes the nude look strong and imposing with the right stance. The dramatic highlights and deep shadows, especially over the torso, help to give features bulk and solidity.

However you approach the subject, though, the ultimate result depends upon your creative judgement and your ability to direct your model through the session gently and tactfully.

By the window *When shooting by daylight indoors, photographers often use the window itself as a theme for their shots*



International airport

For many people, an airport is a place in which to spend as little time as possible. But to the photographer there are plenty of opportunities for pictures, both of the airport and the planes



Most large cities have an international airport in the area, and these can offer an interesting range of subjects for a photographer. Jerry Young specializes in photographing airplanes and already had a good idea of the possibilities before he actually went on this airport assignment.

'Although large airports have a tendency to look alike, each one has its own interesting features and it is easy to spend the whole day trying to capture the atmosphere of an airport on film. Nevertheless, it is a good idea to plan the shots before you start. Most airports cover such a large area that you can end up spending most of the time just walking about from place to place.'

One of the major problems Jerry found was choosing good viewing points without taking shots from restricted areas. As he explained:

'Most airport authorities are strict about areas where cameras may be used and it is advisable to find out what the regulations are beforehand. Even when I thought I was taking photographs in a section where it was allowed, I still

Boarding Most of the activity at an airport takes place outside but do not overlook possible interior shots

Artificial lighting The fluorescent lighting generally used in airports gives a green cast. This was taken with a 20 mm wide angle lens

found people looking at me with suspicion or actually preventing me from carrying on. With this in mind, I had already brought along a selection of telephoto lenses ranging from 180 mm to 500 mm so that I could get some good shots of planes from a distance. Long lenses are essential for photographing the planes.'



Jerry also made a point of arriving at the airport early in the morning so that he could try and get shots of planes taking off into the sunrise. As the sun rose higher he moved to different spots which he had picked out. Towards midday he moved inside so he could photograph the activities inside the main building.

'I always had to try and find a way of making the series interesting. If all the shots of planes were taken with them standing still, it would have been very boring. One of my last shots was of a plane taking off into the sunset and I felt the day was worth it for that photograph alone. I went out of my way to get other specific pictures but I found there was not enough time to photograph all the things I had in mind.

Taking off Planes look most impressive when they have just cleared the ground. The heat of the jets distorting the horizon adds to the effect





Choose your paper grade

A fundamental aspect of good printmaking is knowing how and when to adjust print contrast by careful choice of print paper grade

Working out the right print exposure time is a basic skill of enlarging which is easily learned if test strips are used. But there is another aspect of print making which is important if you are to make top quality black-and-white enlargements. This is knowing how to control print contrast.

If you look at a strip of negatives—especially one with a variety of subjects taken over a period of time—you will see that the density often varies considerably from frame to frame. In addition, you will see that some frames will have a greater range of densities than others. The darkest parts of one frame may be much denser than those of the next frame on the strip.

When you print the negative, the dark areas become highlights in the final picture. You can expose two prints from negatives with different density ranges so that both prints will have similar middle grey tones—but the highlights of one print will be whiter and more

washed-out than those of the other. Alternatively, you can adjust the printing exposure so that one will have deeper, blacker shadows than the other. This can cause important picture details to be lost in the shadows, and give you pictures that are too harshly black and white, which is unacceptable in most cases.

On the other hand, if you print a negative with a limited range of densities you may end up with a print that has no black or white tones at all, only a range of dull greys.

In order to overcome this problem, b & w photographic paper is available in various *contrast grades*.

Matching negatives and grades

The contrast of the negative is influenced by a number of factors. Choice of film, subject contrast, exposure conditions and development all play a significant part.

Ultimately, however, it is careful choice of paper grade which decides what the contrast of the final print will be. Skill is needed to match a particular type of negative to a particular grade of paper to give a result which is both realistic and pleasing.

Negatives that lack contrast—usually

Paper grade choice



Negative lacks contrast



Negative shows good tone range



Negative has excessive contrast

Normal negative *Correct choice of film and correct development for a subject with a full range of tones should yield an easily printed negative*



Soft grade



Print on soft grade is far too flat



Print on soft grade shows all tones



Print on soft grade has best tone range

Normal grade



Print on normal grade is still flat



Print on normal grade has good contrast



Print on normal grade nears contrast limit

Hard grade



Print on hard grade is acceptable



Print on hard grade loses shadow detail



Print on hard grade is far too contrasty

as a result of underexposure—appear flat and 'muddy' when printed on normal grade 2 or 3 paper. To inject sparkle and life into the print, you can expand the grey tones by using a contrasty (hard) paper—grade 4 or 5.

A very high contrast negative—usually the result of overdevelopment—has a 'soot and whitewash' appearance if printed on normal grade paper. This harshness can be toned down by using a low contrast (soft) paper—grade 0 or 1—which is more capable of handling the wider range of negative density.

Providing you are careful with the exposure and development of your films, you are unlikely to need more than three grades of paper to print all your work. You should adjust your film development times so that most of your negatives can be printed on normal grade paper. If your negatives give low contrast

Contrasty subject The appeal of the pattern of the barrels is the contrast between light and shade. Normal grade printing paper preserves sufficient detail



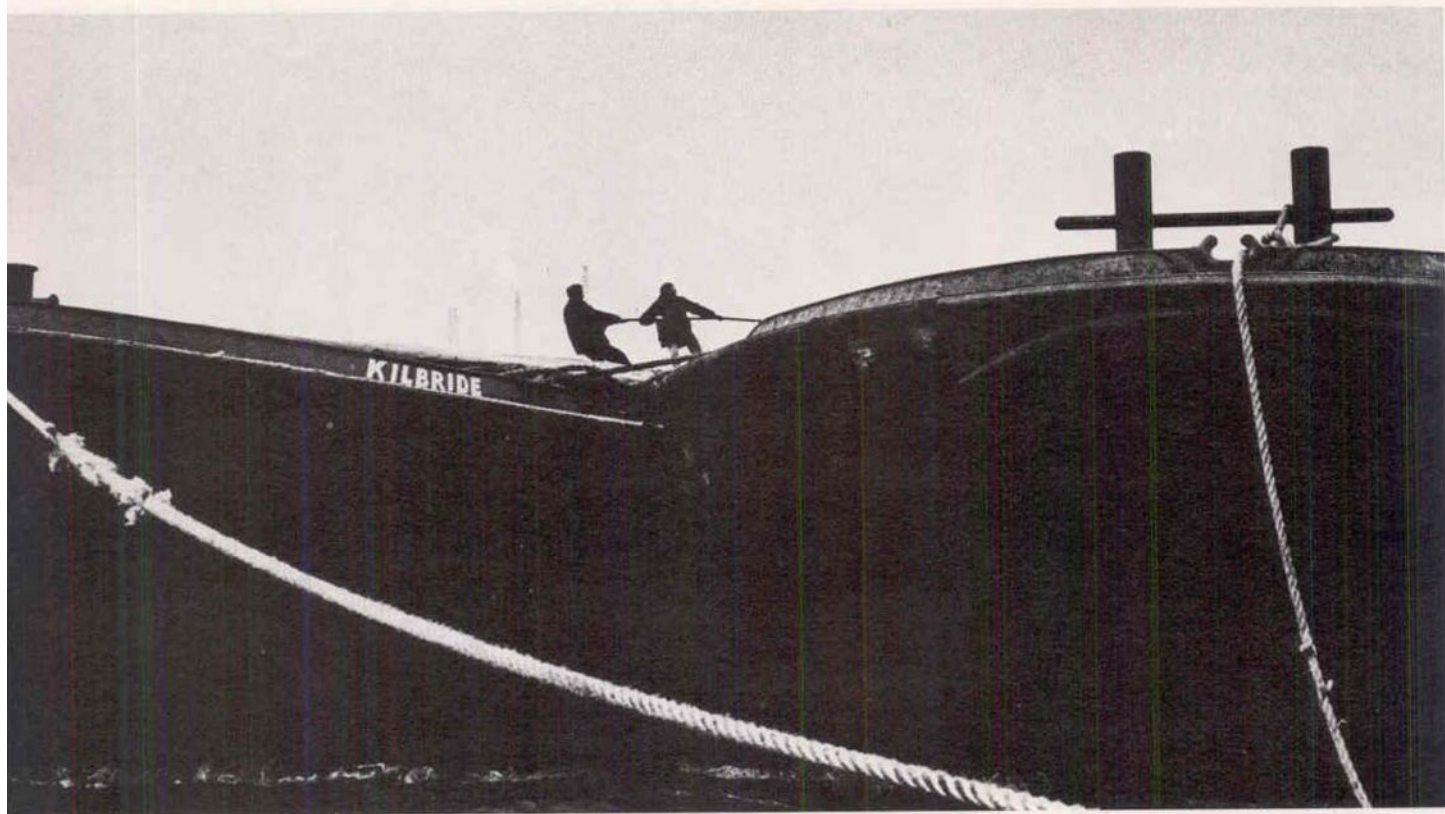
Lesley Nelson

prints on normal paper, try adding 10 per cent to the manufacturer's recommended development time. If your negatives are generally too contrasty, reduce development time by 10 per cent. Manufacturers' recommended development times are meant to be starting points—they may need to be adjusted to take account of the conditions under which you took the photographs. If your exposures and processing are consistently the same for every film, you will soon learn to predict your final results.

It is worthwhile keeping some high and low contrast paper for the occasional 'difficult' negative. For economy, buy boxes of 100 sheets of normal grade paper in the size you use most often, and packets of 25 sheets of high and low contrast grade paper for special occasions.

Matching grades and subjects

While one usually thinks of contrast control as a means of rectifying contrast 'errors' already present on the negative, it is worth bearing in mind other more



Julian Stapleton

Contrasty printing To accentuate the form and composition of a photograph you can print otherwise normal negatives on a more contrasty grade of paper

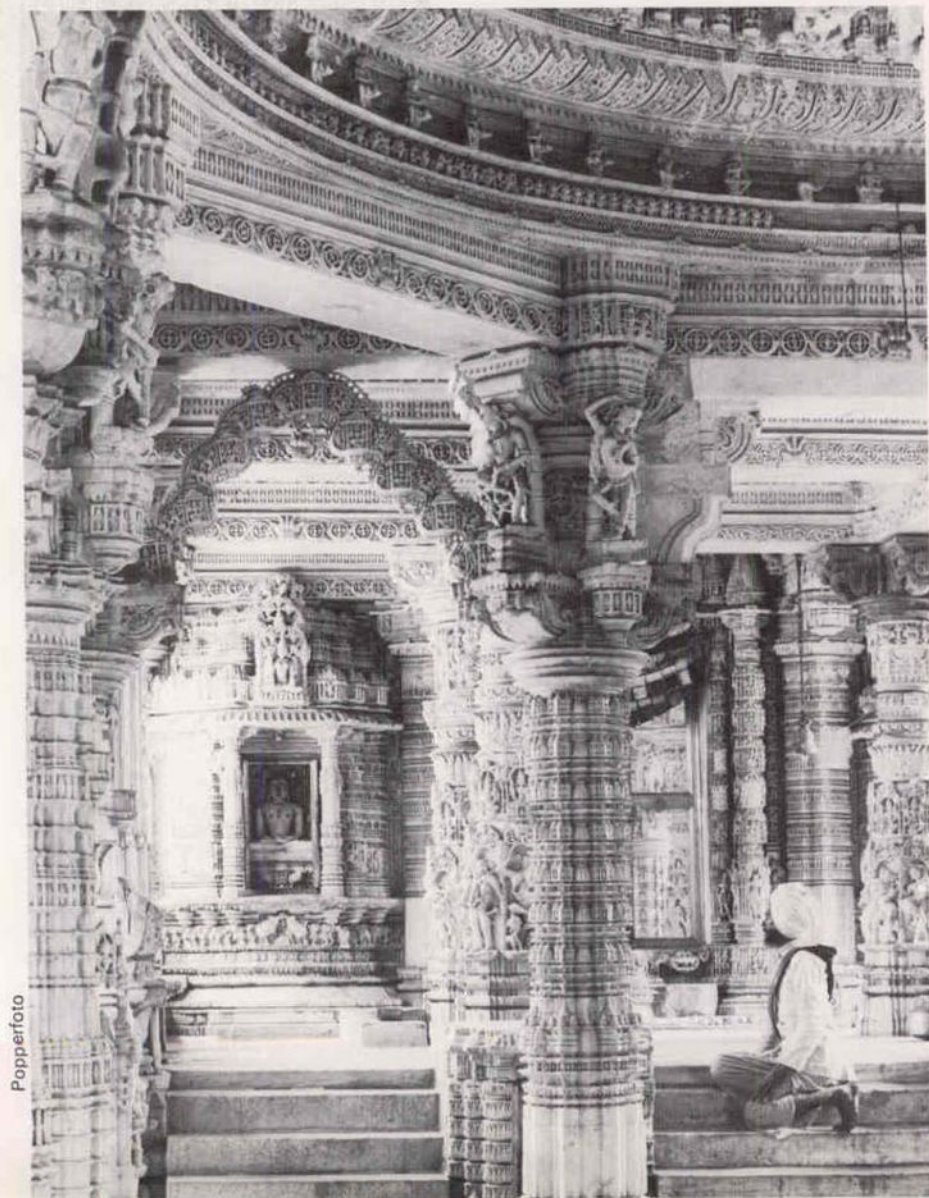
Temple detail Soft grade paper is able to cope with negatives which have a very wide range of detail in the middle tones between light and dark

subjective points regarding tonal reproduction. For example, there is no reason why you should not use a very hard grade of paper to print a normal contrast negative if you consider the resulting tones help the visual effect of the print.

On the other hand, some pictures, such as portraits, tend to look better when printed on a lower contrast grade of paper than normal. This is because soft grade paper can usually handle the fine shadow details and flesh tones, and the lower contrast improves modelling. High contrast, 'high key' portraits without deep shadows can also be successful with certain subjects.

As a rule, the higher the contrast of the picture, the more pronounced the detail and graininess of the image becomes; with lower contrast, the rendering of the subject becomes more subtle and the number of tones in the print increases, lessening the effect of undesired detail.

What you must decide is whether the end result on normal grade paper is any better than that given by using the 'wrong' paper grade. The decision can be a difficult one, and the simple answer is to make a set of comparison prints. As your experience increases you will learn to predict the likely effects of different contrast grades without making test prints.



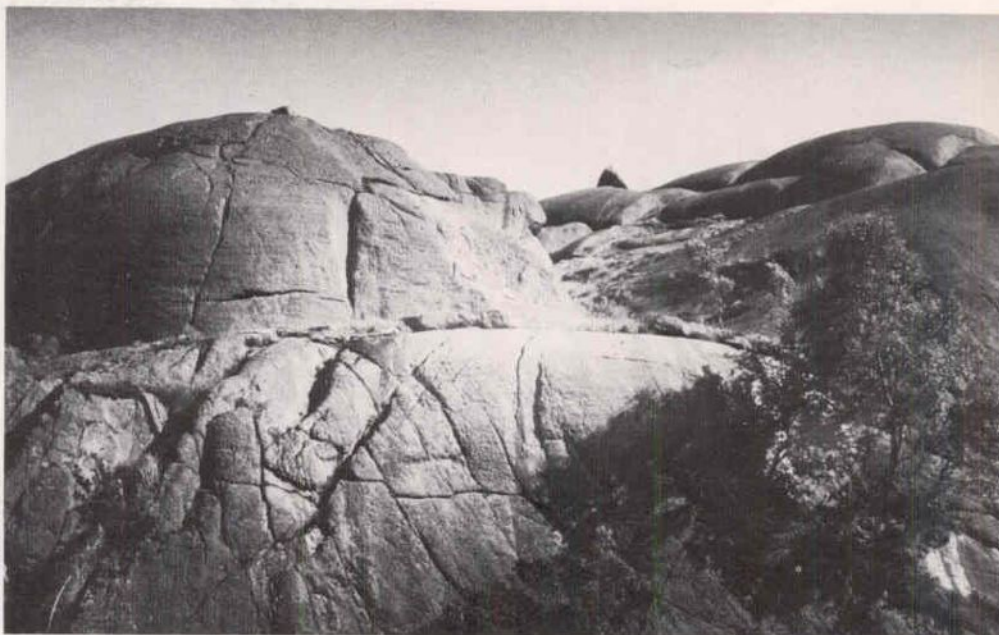
Popperfoto

Shades of light and dark To avoid excessive contrast, you can print many otherwise normal negatives on a softer grade of paper. Here, delicate shadow tones would be lost if the negative was printed on normal or contrasty paper

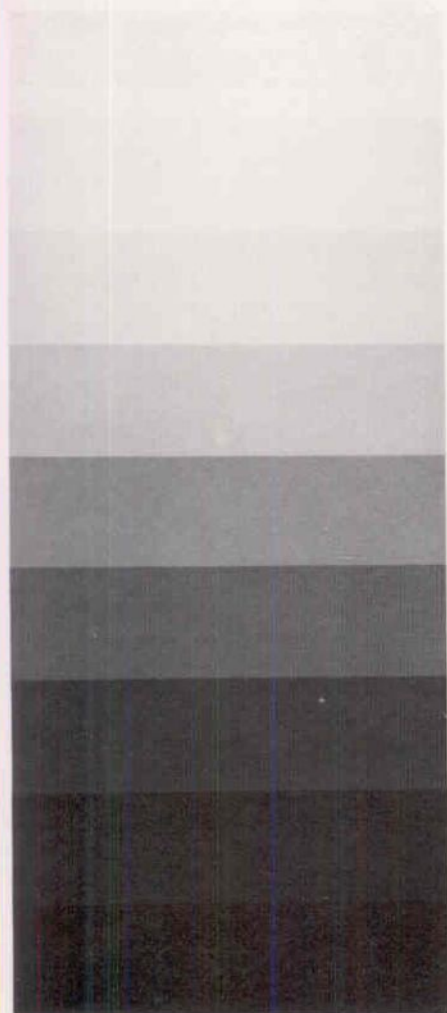
Variable contrast paper

To get around the problem of overstocking rarely used grades of paper, you may prefer to use variable contrast paper. This entails the use of separate filters which are placed in the enlarger light path. When the colour of the printing light is changed, the variable contrast paper emulsion responds by changing its exposure range. The effect is to allow one sheet of paper to do the job of high, normal or low contrast paper, according to the colour of the filter in the enlarger. You only need to stock one box of paper for each size of print you make. The use of variable contrast paper will be covered in a subsequent article in this darkroom series.

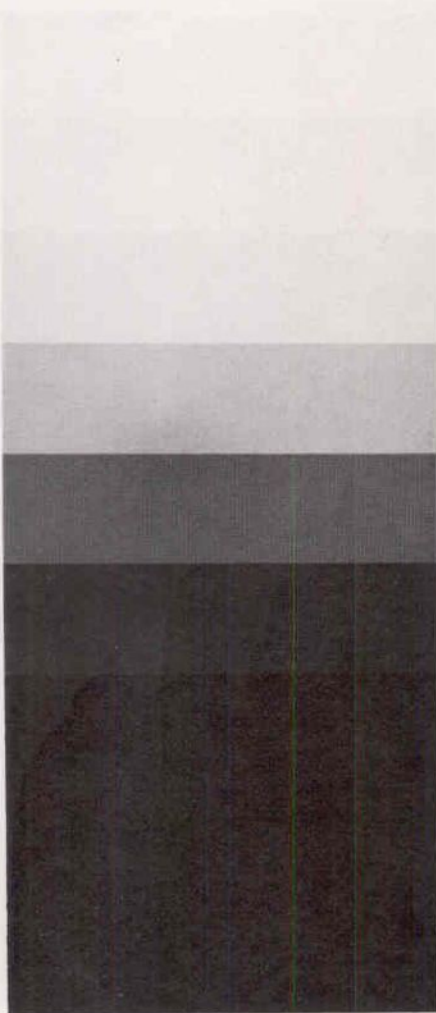
Suzie E. Maeder/Colorific



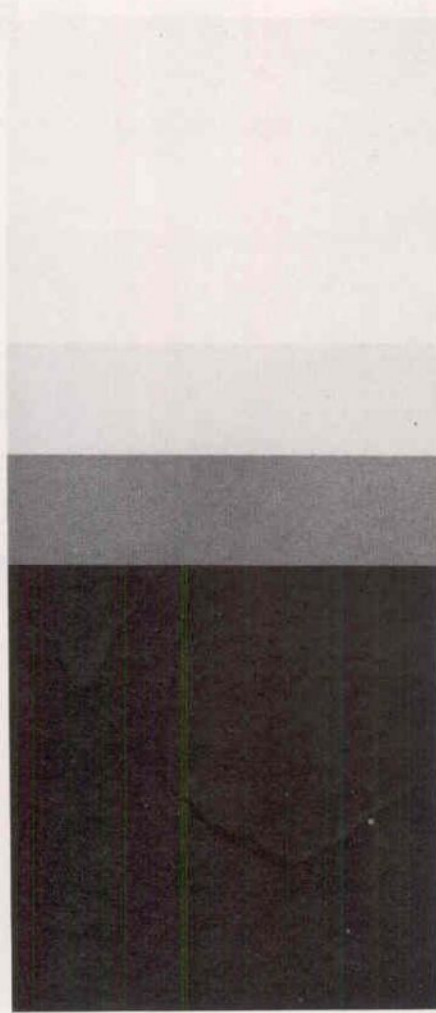
Paper tone ranges



Soft grade A full range of negative tones can be printed on soft grade paper. The printing range can be up to 1:60, meaning that total blackening needs up to 60 times the exposure for the faintest grey



Normal grade The printing range of normal grade paper is between 1:10 and 1:20, depending on the manufacturer's rating of 'normal'. This grade of paper is suitable for the majority of negatives



Hard grade The printing range of more contrasty papers starts where some 'normal' papers leave off. Although the range can be as little as 1:3, hard papers with a range of 1:6 are more usable



World of photography

Sailing with Alastair Black

Sailing photography is a specialized skill that demands vision, courage and plenty of patience. A disillusioned dentist took up the challenge . . .

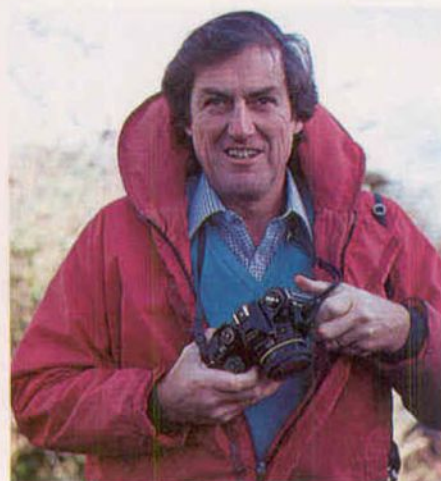


Alastair Black remembers coming out of a tube station in London in 1973 and glancing at a news stand. A copy of the magazine *Yachts and Yachting* was on display with a black and white picture of dinghy racing on the first front cover, and seeing it gave him a kind of buzz he had not felt for years.

Black is one of those enviably decisive people with a remedy for boredom: if your work gets tedious, do something else. In 1973 he had reached a vaguely bleak stage in his early 40s when life stretched ahead of him in an unrelenting pattern of stifling solidity. He was a dentist specializing in orthodontia with a flourishing practice in Lee-on-Solent and a comfortable home life with Elne Black, the actress, and their four children. But after 20 years in the profession, he began to feel that dentistry no longer provided a challenge and he was becoming less and less enthusiastic about his work. 'You're so safe as a professional person. You go through the motions and you're assured of a comfortable living for life. But I felt life was passing me by.'

Colourful sails Black used a motor boat to get him into the action during this race off Sardinia

The photographer Alastair Black finds an anorak ideal for protecting his camera from salt water spray



Lesley Nelson



Rolling A low viewpoint heightened the impact of this view of 'Formidable' during the Admiral's Cup

Silhouettes The sun sinks as Black closes in under the bow with a wide angle lens to make the most of shapes

Aerial view Off the Florida coast with the wind blowing at 30 knots. Taken with an 80-200 mm zoom lens

Another irksome factor was that in his professional capacity Black met only people who were reluctant to visit him and who regarded his expertise as an unwelcome necessity. 'Dentistry is basically a depressing profession and I felt I wanted the prospect of doing something nice, something joyous and, I know this sounds ridiculous, but the idea of creating a beautiful image was an important element in it.'

At the time, Black was a keen dinghy sailor and an amateur photographer who belonged to his local camera club. He began to look critically at sailing pictures and felt that they lacked the stimulating quality that was the essence of heavy weather sailing. He started taking pictures with a secondhand underwater camera. 'I could see there was scope for a different approach to sailing photography. I wanted to get away from conventional portraits and produce photos that were involved and intimate.'

A two-week photographic course at a summer school in South Wales was the major turning point. He was invited to join the London College of Printing as a special student, which meant that he could attend lectures he thought useful and ignore the rest. Without regret, Black relinquished the respectable world of dentistry and became a student, mixing with young people the age of his own children who inspired him with ideas they were too lazy to use, while they in turn were amused but impressed with his appetite for knowledge and experience in a new field.

By this time he was using a Nikonos underwater camera with a 35 mm lens and this was soon supplemented by a 21 mm Nikkor lens with a waterproof housing fitted to the camera. He used

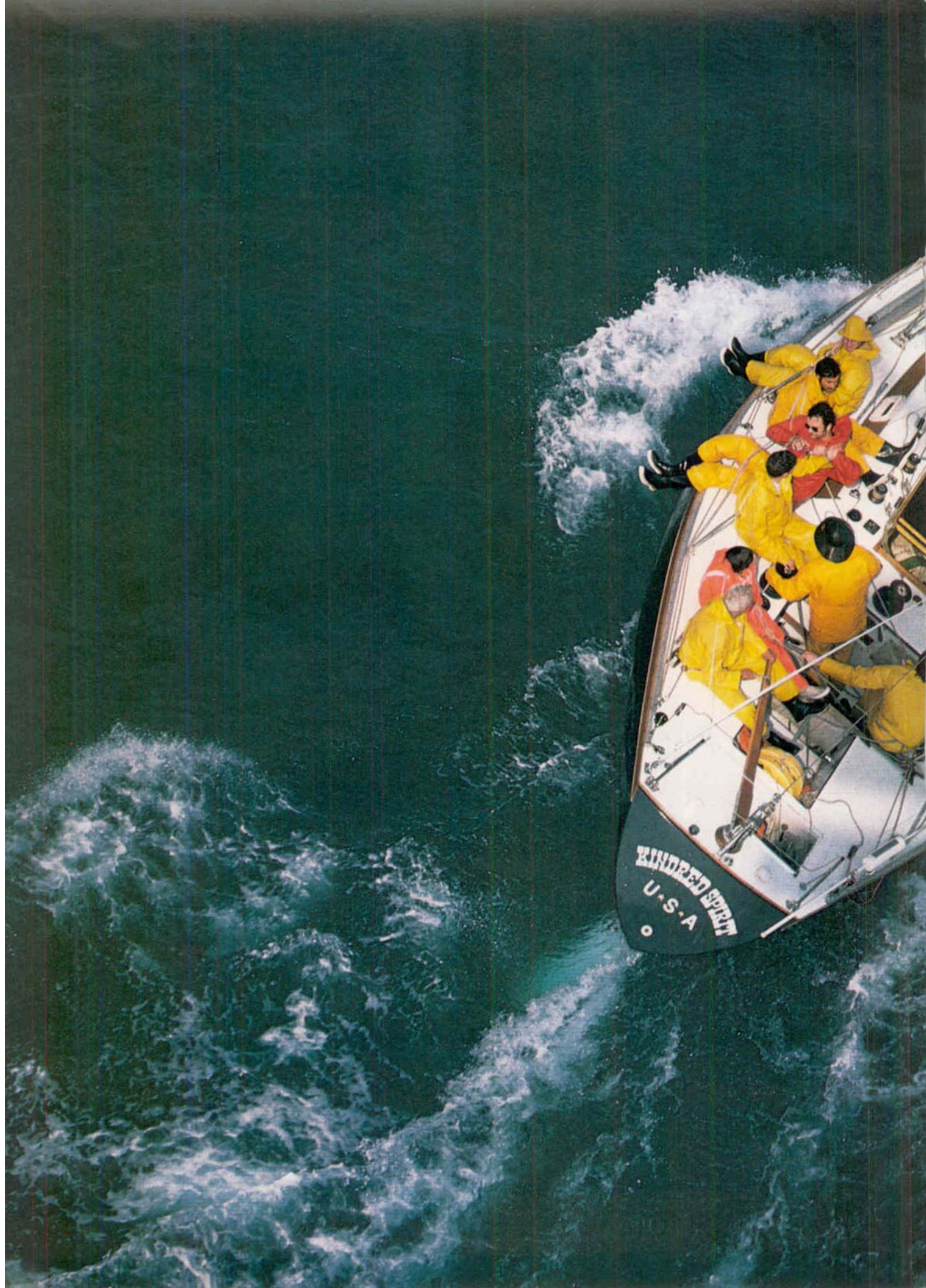


Kodachrome 64 film and gelatin skylight filters inside the lenses, although he abandoned the filters later because they tended to give clouds a pink cast.

Two years spent at college being lectured by professionals taught Black to be more aggressive about his photography and made him realize it was necessary to travel. In February 1975 he packed his bags and set off for the United States to cover the Southern Ocean Racing Circuit. Once there, he realized that the conventional shooting positions, from shore or from boats, gave rather limited scope so, showing typical initiative, he hired a helicopter. Sitting astride the open doorway, Black shot off a dazzling set of mast-high photographs that were instantly snapped up by American maga-



Alastair Black





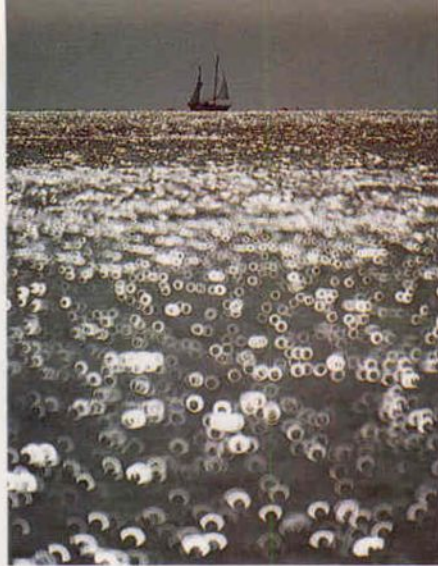
zines. He says he was lucky, but it was with shrewd insight that in 1977 he produced the first annual *Alastair Black Calendar of Yachting*, establishing himself as a household name among the sailing fraternity of America.

Since then he has travelled constantly, usually on a speculative basis, to sailing championships around the world, and as the competition grows among sailing photographers, Black grows more ambitious. 'At one time I was the only photographer in a helicopter. Nowadays there are often a dozen and it can get a bit hazardous. Once, in Hawaii, a helicopter carrying spectators fell into the sea. Luckily, no one drowned and I got a good series of dramatic rescue pictures.'

As the skies grew more crowded Black took to the sea, swimming out through the Hawaiian surf in flippers and a buoyancy jacket to shoot windsurfers as they wavejumped within inches of him. Although exhilarating, it demanded a lot of patience as well as courage. He could be bobbing about in the water for a couple of hours holding his Nikonos camera, underwater housing and 35 mm lens, waiting for the right combination of light, wind and angle. 'Sometimes you get a few good shots, sometimes nothing. You are so dependent on nature, and it's important to know the sport thoroughly so you can anticipate what will happen.'

Black learned to windsurf in England, but for the most dramatic pictures he flies to Hawaii where the waves are spectacular and some of the world's best windsurfers are to be found. 'They all love to be photographed, but it's got to the point where they want modelling fees from me because they know I'm going to be able to sell the pictures.'

There are many occupational hazards to Black's brand of photography. On one occasion, for instance, he damaged a



Highlights A 500 mm mirror lens created doughnut shaped highlights in this view taken looking across the Solent



Catching the wind Black was hoisted up in a bosun's chair for shots of these billowing spinnaker sails

boat while covering a regatta in England. He was using a Searider rubber dinghy, which can withstand gales of force 8, when he ran into the stern of a motor boat. There were no excuses for the collision as Black is the first to admit. 'My clever manoeuvre didn't work, that's all, and I careered into a large motor boat and punctured the dinghy.' Nowadays he has a helmsman who is sensitive to the tricky manoeuvres required, since much of his photography is done from a fast motor boat with a top speed of between 25 and 30 knots—enough to keep up with racing yachts.

'Salt water spray is always the biggest problem. I keep my camera equipment in soft bags and the camera round my neck covered by a zip-fronted jacket that opens easily. The technique is to turn your back on the spray and then to anticipate when to duck out, take a picture and cover up before the next dollop.'

'When conditions are ideal, with a lot of wind and the sun coming through the clouds, the experience is exhilarating. You're part of the sailing, trying to catch the activity and the atmosphere, and the adrenalin flows out through the lens.'

The only time Black wishes he was back in the stable world of dentistry is when he gets seasick, but that only occurs when he forgets his travel pills. 'It's absurd for a sailing photographer to get seasick so easily, but I have done ever since I went sea fishing as a boy. I remember spending one afternoon being sick among the nets.'

A Fellow of the Royal Photographic Society, Black has been named Sports Photographer of the Year in the colour section and has won Adidas awards for professional sports photography.

As his reputation grows and the commissions multiply, he has found himself torn between remaining small and doing all the photographic and administrative work himself, or building an Alastair Black organisation with people to manage the marketing of his work and his expanding library of transparencies. After working in a practice with three other dentists he values the simplicity of working on his own, and he is gratified to be operating among people who delight in his expertise instead of shrinking from it as they once did.

Black is currently exploring the techniques of underwater photography as he masters the art of scuba diving, and he is absorbed with the potential of travel photography. 'I'm not interested in just a simple record but in strong, powerful images—the sort of pictures most magazines unfortunately don't choose to use because the magazines are not adventurous enough.'

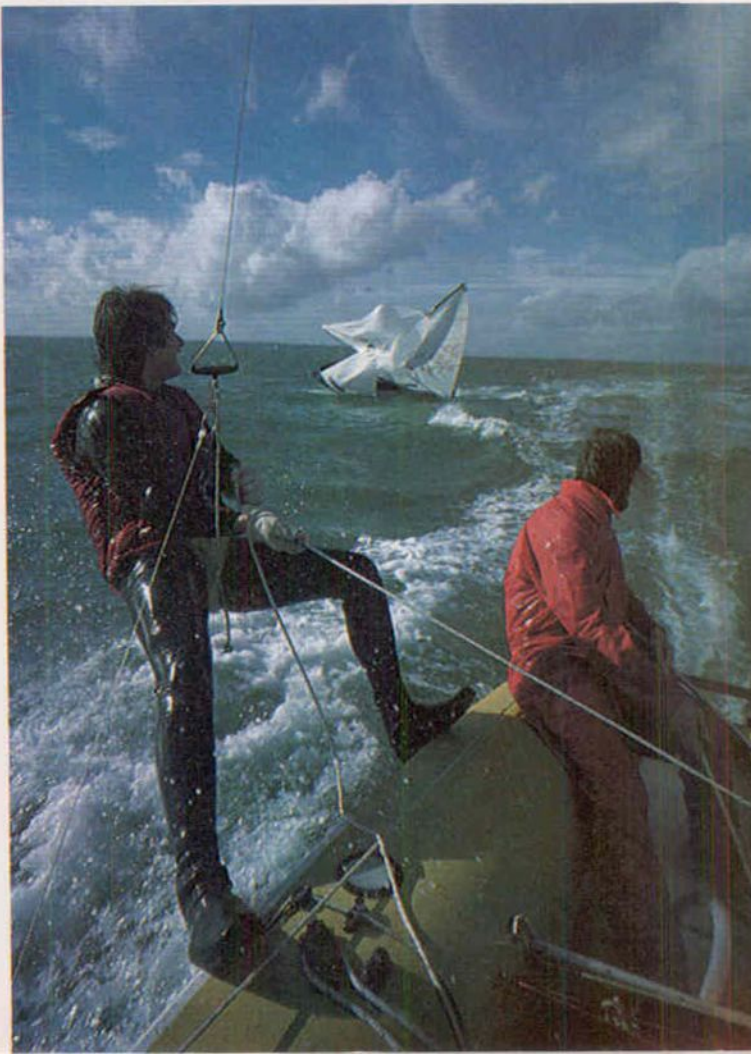
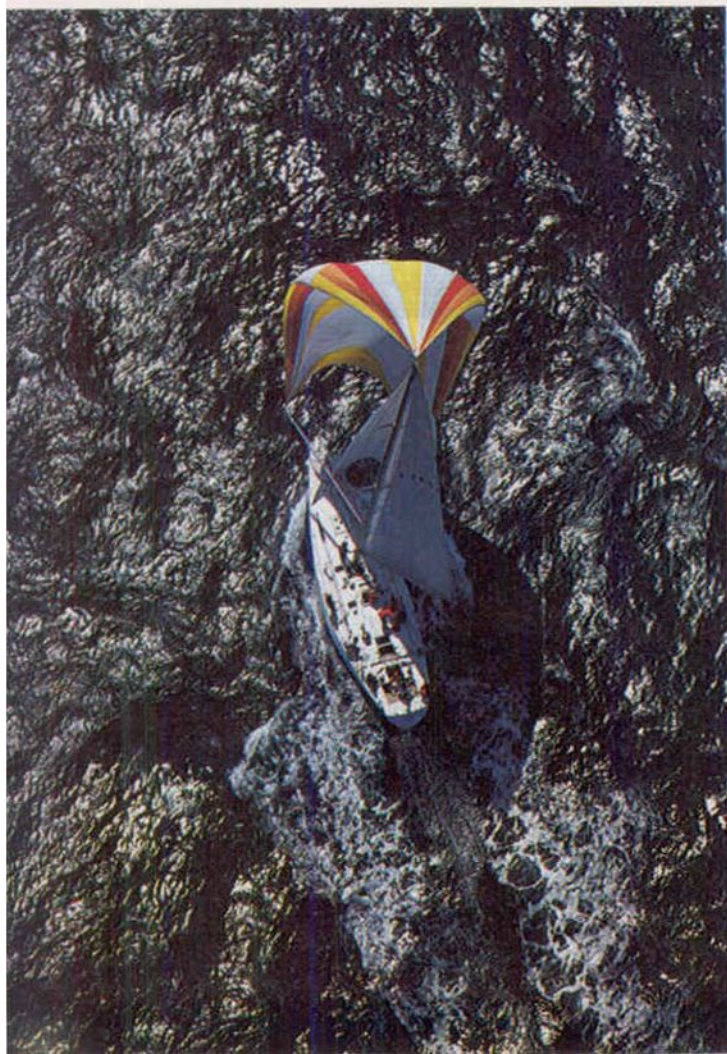
Windsurfing in Hawaii An underwater camera was essential here

Sardinia Cup race Photographed high above the Mediterranean

Capsized Black needs to keep his camera constantly at the ready

Stormy weather Gale force conditions in the Channel. Black considers this one of his best heavy weather shots





Improve your technique Flash on the camera

A flashgun is one of the first accessories people buy for their cameras. Often guns are mounted directly on the camera, but this causes problems under many conditions



Modern flashguns are the answer to the prayers of a good many photographers. Shooting indoors always used to be a problem. You either had to work in the artificial atmosphere of a studio or carry a lot of bulky and often fragile equipment round if you wanted to work on location, or trust the available light. The modern convenient, sophisticated small electronic flashgun overcomes those problems for all but the largest subjects. In addition, the light given out is very similar in colour to daylight so you do not need to use special film or filters.

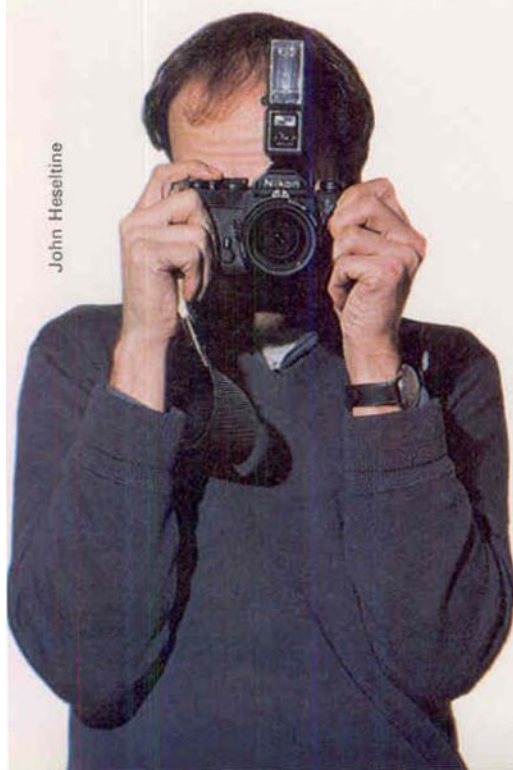
Most people tend to use flashguns indoors to light portraits, often in a rather indiscriminate fashion, working on the basis that any record is better than none at all. However, it only takes a little experimentation and effort to improve these results, perhaps extending your technique into other, more adventurous, areas. And it is also worth using flash to make interesting records of subjects such as wedding presents, before and after shots of redecorating schemes, or your baby's first steps—just as likely to take place in a dimly lit living room as outside on the lawn.

How they work

Unlike flashbulbs and cubes, electronic flash guns are completely reusable. The flash is produced by passing an electric current through a tube filled with an inert gas. For those smaller models that fit easily on to the camera, the electrical power is supplied by a set of small dry batteries fitted into a compartment in the unit. Larger models use separate re-

A group of people A flashgun mounted directly on the camera is useful for taking off the cuff shots like this

Fooling the sensor An automatic gun has a sensor to control the light output. Since its beam is smaller than that of the flash, you can have problems if the subject is not framed centrally



John Heseltine



Hayward Art Group

chargeable nickel-cadmium batteries. These are more expensive but much more economical.

Synchronization

No matter how powerful the gun, however, the subject will not be properly illuminated unless the flash is discharged exactly at the moment when the shutter is open. Such synchronization is ensured in two ways. Some cameras are fitted with *hot shoes*, usually on top of the camera. These are slide-in brackets into which a foot on the base of the gun is pushed. When this is done an electrical connection is established between the two that fires the flash as the shutter reaches its open position.

Not all cameras have hot shoes but all 35 mm models have connection points for synchronization leads. These sockets are usually located on the camera body close to the lens mount but this is not invariable. The lead is plugged into both gun and camera, and the gun then fires whenever the shutter is pressed.

Older cameras may still have an M and X setting. The M setting was for synchronizing bulbs, which have a slightly different firing time. If you have such a facility on your camera always keep it set at X, which is the setting for electronic flash. At the M setting using electronic flash, you will get no pictures.

Automatic guns

Modern designs can be divided into two types, manual and automatic. The latter guns all have a manual option which you can use when necessary.

Automatic guns have a photoelectric sensor—a 'magic eye'—on the front of the unit. Its job is to measure the amount of light reflected back from the subject when the flash goes off. As soon as the programmed amount of light has been received back, it cuts off the flash,

A touch of glamour *If you are careful when using the flash mounted on the camera, you can use it for a range of subjects. A diffuser was used here*

Small children *With young children you have to be ready for spontaneous shots. Using the flashgun fitted to the camera can help you to act quickly*

James Walker



Arthur Miligan/Northern Picture Library

giving the correct exposure.

It sounds as if this system should guarantee perfect results every time, but unfortunately this is not always true, and there are occasions when a light or dark background can fool the sensor.

The sensor will also be misled if you are taking a shot of a highly reflective subject or one which has a mirror or a piece of glass behind it. The light is then bounced straight back at the sensor causing extreme underexposure.

In addition, the sensor measures an angle of only about 12° to 20° of the total subject area so if your subject is out of its path, the sensor will read off the background. In this case the gun will have to be used manually.



Reflections One of the things you must watch out for is a reflective surface, such as a mirror or even a framed picture, in the background. This may cause a distracting reflection



Insufficient coverage Another problem is that of not getting enough illumination for a wide angle lens, as here. Diffuser panels will increase the coverage

Auto guns have a further drawback in that there is a limited range of distances over which the auto sensor will work. But within this range, which is normally adequate for indoor work, they allow you freedom of movement without constantly having to worry about the exposure setting.

The simplest automatic flashguns allow you just one aperture for each film speed. The camera must be set to the aperture appropriate to the speed of film you are using, and all shots taken at that aperture will then be well exposed. More expensive guns have a choice of output powers, so you have more control over the aperture you work at.

Manual flashguns

When using a purely manual gun or an automatic gun set to the manual mode, you will need to make a simple calculation to get the correct exposure.

Outdoor flash There are numerous shots which you can take outside using a flash to provide the light. This photograph was taken when it was almost dark

Although it requires more effort, it avoids incorrect flash exposure caused by deceptively reflective surfaces.

Every flashgun has a guide number—the higher the number the more powerful the flash. To get the correct exposure, divide this number by the camera-to-subject distance and you will have the appropriate aperture. For example, a typical guide number for a gun in the medium power range is 23 when using a film rated at 100 ASA (ISO). The subject is 2 m away. This gives an aperture of approximately $f/11$.

If you have an SLR or a rangefinder camera it is a simple matter to measure the distance. Just focus the camera and read the information you want off the focusing ring. If you do not have such a camera, you have to estimate the distance.

Guide numbers are now in metres but feet guide numbers may be en-

countered so be careful not to confuse the two otherwise you will get some odd results. They are also given in relation to a specific film speed, usually 100 ASA. With the gun you should get a chart giving you the guide numbers for other film speeds. If there is no chart the new number can be calculated fairly easily. If the speed of the film in your camera is double the given one, that is 200 ASA instead of 100 ASA, you multiply the number by 1.4. If it is 400 ASA, that is 4 times the original given speed, you multiply by 2. If it is only half, that is 50 ASA, you multiply by 0.7. The reason for these odd numbers is that the scale is based on a square law.

Fortunately, most manual guns have a calculator dial or sliding scale set into the side of the unit on which you can work out apertures for given distances.

Shutter speeds

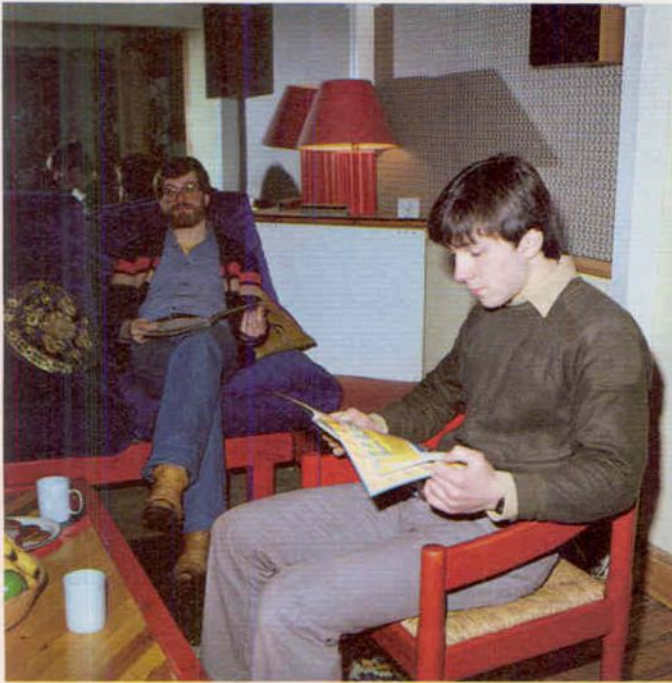
So far shutter speeds have not been mentioned. This is because the duration of the flash is only $1/1000$ sec or less. Close-ups with an automatic gun can reduce the time to as little as $1/40,000$ sec. This can create a problem with those cameras fitted with focal plane shutters, which include all modern 35 mm SLRs. Because the blind moves across the frame, the gap exposing the film in a continuous action, such very short flashes of light will only reach the film during part of the shutter movement, unless a relatively long exposure time is chosen where the gap in the blind is as wide as the film. In practice this means that shutter speeds faster than $1/60$ should not be used with most focal plane shutters.

Testing the flash

Before you begin shooting it is a good



Irene Windridge/Northern Picture Library



Foreground and background Another problem arises if subjects are at different distances. The sensor reads off the foreground so the rest is underexposed

idea to test the battery, particularly if you have not used the gun for some time. Many units have a test circuit that lights a bulb if everything is all right.

If you get an underexposed set of pictures but the batteries are good, make a series of careful tests before you return the gun to the shop or take it to a photographic mechanic. It is quite possible that you set the controls incorrectly or miscalculated without realizing it.

Recycling time

Each time that the gun is fired all or part of the electrical charge, which is stored in the capacitor, is discharged through the flash tube. Before you can fire again, the capacitor must recharge. In a modern gun with fully charged batteries this can happen in a fraction of a second, particularly if it is an automatic with a thyristor circuit that channels excess power back into the capacitor. However, as the

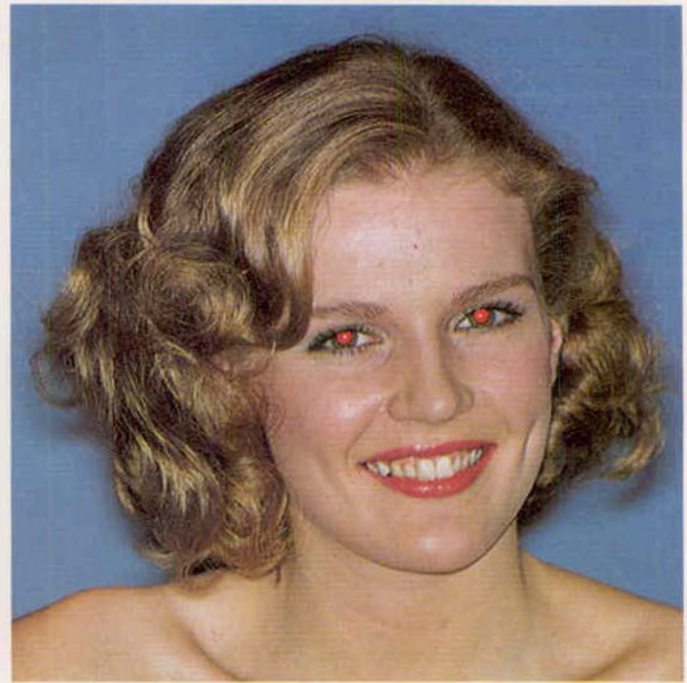
power of the batteries diminishes the recycling time will increase. If you try firing before the capacitor is ready the flash will lack full power and you will get an underexposed picture.

On-camera flash

The simplest way to use a flashgun is by attaching it to the camera, particularly if the latter has a hot shoe. Since the lens will be pointing at the subject you can be sure that the flash will be as well. As long as the gun has enough power to bridge the intervening distance, you can expect at least some sort of picture.

Unfortunately, with such direct illumination, the result is rather harsh with sharply defined shadows. If you are taking a portrait you will, in addition, get a reflection from the skin that makes it look unpleasantly shiny. Colours can also look rather garish.

Another unpleasant result of on-the-



Kim Sayer

Red eye If the flashgun is positioned close to the camera lens it is likely that the pupil of the model's eyes will turn bright red because of light reflected off the retina

camera flash is an effect called *red eye*. This occurs in a portrait when the light source is very near to the lens. The light enters the eye and is reflected off the retina, which contains many blood vessels, straight back to the lens. So the centre of the eye appears red, which is very disturbing. The only cure is to move the gun away from the camera.

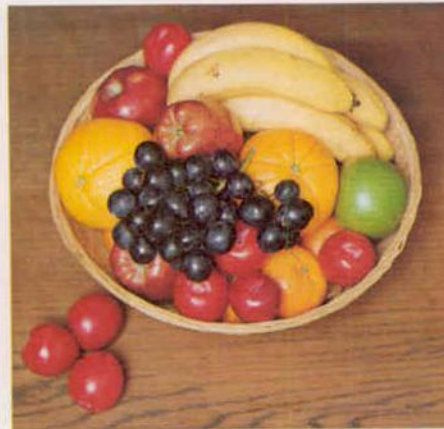
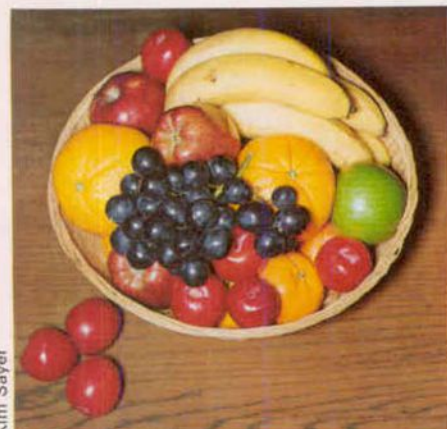
Diffused flash

A diffuser that scatters the light emitted by the flashgun is one way of avoiding some of the problems without taking the unit off the camera.

The simplest diffusers are tissue paper, muslin or even a clean handkerchief taped over the tube and reflector. If you have an automatic gun be careful to avoid obscuring the photoelectric sensor. Some manufacturers make plastic diffusing screens as accessories.

However you diffuse the light one thing is certain: some of it will be absorbed and this has to be allowed for when judging the exposure. If you have an automatic gun the sensor takes care of this. If you do not, the aperture should be opened up by at least one stop, although you will need to experiment a little before you can be sure of the precise effect on exposure.

Whatever the means you choose to create the diffusion, the effects are roughly the same. Shadows are lighter, containing more detail and the edges are less distinct. However, the effect will still be a little flat. As the flash is close to the lens, most of the shadows created are on those parts of the face hidden from the lens. If you want a more rounded effect to capture subjects modelled by shadow, then you have to move the flash off the camera away from the lens.



Diffused flash Without a diffuser (left) the light is harsh. The diffused shot (right) has softer shadows and reflections

What is light?

Light is so familiar that we take it for granted—we rarely think about what it is, or why it behaves the way it does. But knowing about the nature of light is very helpful to the photographer

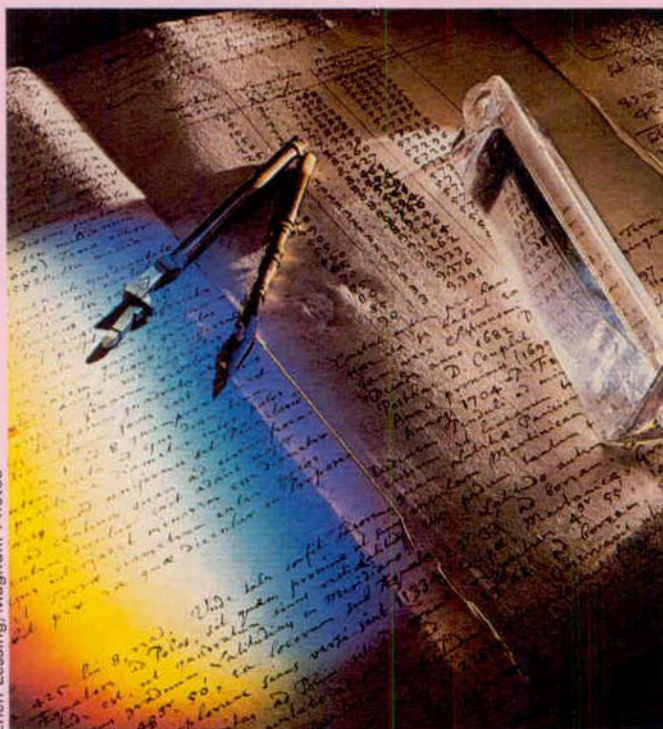
Light is the photographer's medium and a photograph is nothing more than the image of a certain pattern of light recorded on film—you even need light to see the photograph. The nature of light has a crucial effect on every picture you take. Yet very few photographers actually know much about it.

Unfortunately, they are not alone. Scientists are still arguing about the nature of light as they have done for centuries. Nevertheless, certain things are now clear.

First of all, the light we see—visible light—is just a small part of the range of energy known as *electromagnetic radiation* that can be emitted from every atom in the right circumstances. Although the source of electromagnetic radiation and its effects are often obvious, no one yet knows precisely what it is. Some people used to think it was a series of minute particles. Others thought it was a series of waves. Nowadays it is believed that it is a combination of both, consisting of fast moving but minute packets of elementary particles, *photons*, radiated in regular pulses behaving very much like waves.

In considering the wave nature of light, wavelength is a vital characteristic. The wavelengths of light are so extremely small that they are measured in nanometres (nm), each equal to one millionth of a millimetre.

The wavelengths of visible



Erich Lessing/Magnum Photos

The spectrum shines across the notebook of Isaac Newton, who first suggested that white light contains all colours

light extend from about 400nm (violet) to 700nm (red), just a very small part of the whole electromagnetic spectrum which ranges from gamma rays of very short wavelengths to long wave radio waves.

The human eye, however, can only see a very small range of wavelengths falling in between the two extremes. This small range is known as visible light and is the photographer's main area of interest. Certain films can

record wavelengths outside the visible spectrum, such as X-rays and infrared radiation, but it is the visible region that is most important.

Colour

Look at a bright red car or a deep green field and it is difficult to believe that colour is not an inherent property of these objects; but it is not. They are only visible because they reflect light from the sun, and the car only appears red and the field green

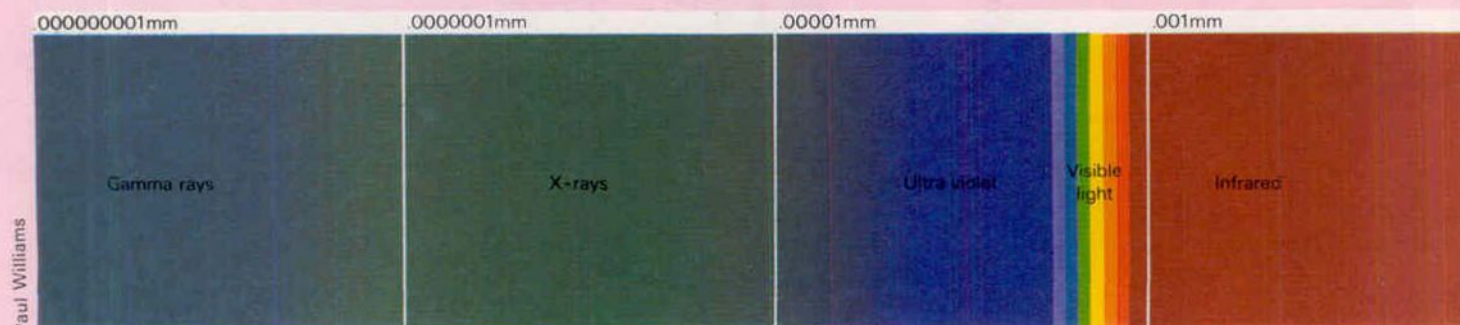
because they reflect certain wavelengths more than they do others. These particular wavelengths are seen by most human eyes as red and green respectively.

Each wavelength in the visible spectrum is seen as a particular colour, and when we see each colour we are simply seeing more light of the appropriate wavelength. Just as there is a wide variety of wavelengths, there is an almost infinite variety of colours—all the colours of the rainbow, in fact. Violet light has the shortest wavelength while red has the longest.

When the wavelength becomes shorter than that of violet light it becomes ultraviolet light and we can no longer see it. However, all photographic emulsions are sensitive to ultraviolet light and will record it. In fact, levels of ultraviolet light are not normally high enough to be obtrusive and if they are—such as near the sea—the fault can easily be remedied by placing an ultraviolet absorbing filter over the camera lens to cut out light of this wavelength.

Light sources

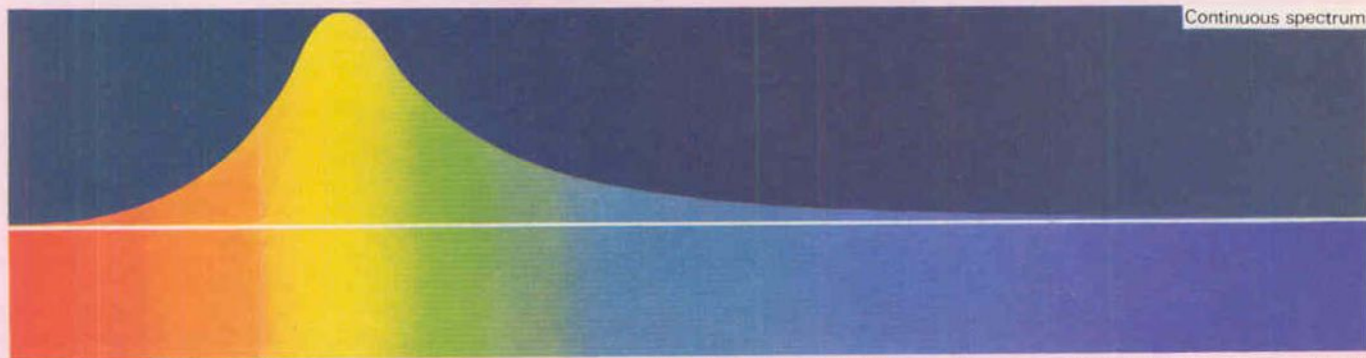
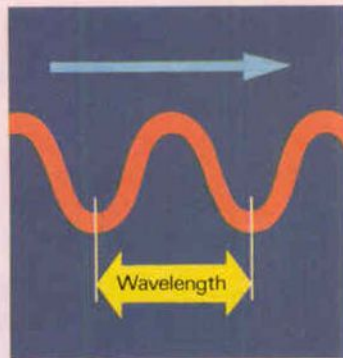
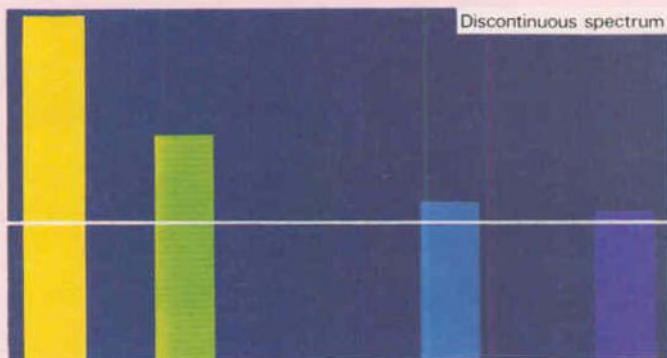
Some light sources, for example, red lights on the back of a car, are obviously coloured, but most daylight appears to be white. White light, however, is not a single wavelength but a mixture of the complete spectrum of visible light. You can see this for yourself with the aid of a prism and a sheet of white



Discontinuous spectrum

Light from mercury vapour street lights has only a few bands of colour (right), whereas daylight is a continuous spectrum and contains varying amounts of every colour (below)

Wavelength Light is a waveform which varies in intensity. Wavelength is the distance between two peaks or troughs (far right)



Paul Williams

card. The optical qualities of the prism split the white light of day into its constituent wavelengths and you see a band of colours on the card in a very definite order. A rainbow is the result of the splitting of white light by water droplets in the atmosphere in exactly the same way as a prism splits light into its component colours.

Normal electric tungsten light—like that from the average domestic light bulb—produces a similar spectrum of colours, but it contains a higher proportion of red than does daylight. But whereas the eyes adjust very rapidly to reduce this redness and give colours their daylight values, the camera cannot. So if pictures are to be taken in tungsten light, the redness must be filtered out

or you must use a special film that is more sensitive to all the other colours.

Colour balance is a more severe problem when the light source produces a *discontinuous spectrum*. Fluorescent lights are the most common example of this sort of source. The light you see coming from fluorescent tubes is not as simple as it seems since light is radiated in two stages. The *primary radiation* is from the glowing mercury vapour and this produces a *line spectrum*—emission at more or less single wavelengths of violet, blue, green and yellow-green. This radiation stimulates *secondary radiation* from the fluorescent material coated on the inside of the tube and this gives a normal full spectrum; so there is a

normal spectrum superimposed on the mercury lines. The light may look white to the human eye but to a colour film it is likely to appear very greenish.

Monochromatic light

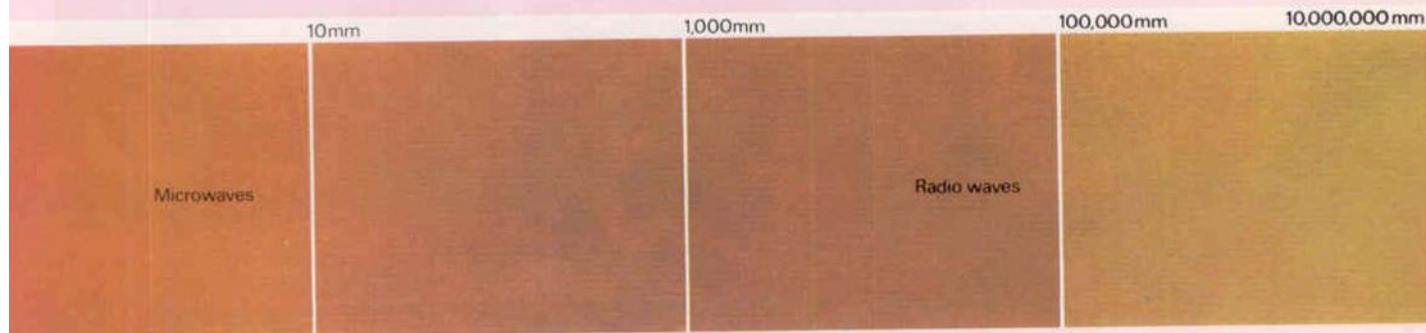
You may encounter monochromatic light in the form of a safelight for certain types

of printing paper. As its name suggests it is light of a single wavelength but the term is often extended to include a narrow band of wavelengths in a particular region of the spectrum. The sodium vapour lighting you see in many streets is also monochromatic, consisting only of yellow light.

The whole spectrum

Visible light is only a small portion of the electromagnetic spectrum

Rainbow Drops of water in the atmosphere can split up white light in the same way as a glass prism



SLRs—auto or manual?

There is a greater choice of 35 mm SLRs available today than ever before, and many of them are automatic. They may all look similar but the ways in which they operate often differ fundamentally



Jon Bouchier

As single lens reflex cameras have become more complex, it has become increasingly difficult for a photographer to decide which particular make and model is best suited to his or her needs. Some automatic cameras are now controlled by a microprocessor and have as many as five different methods of setting the exposure. This does not make the choice any easier for the potential purchaser of an SLR. On these pages we look at the different operating methods how they affect the handling of the camera, and what kinds of photography they are best suited to. In the second part of this article the other important features of the more common SLRs will be covered.

Traditional methods of exposure

Before the introduction of automatic exposure control, and through the lens light meters, photographers used separate, hand-held light meters to determine the correct exposure. They first took an exposure meter reading of the light falling on the subject and, by using the scales on the light meter, they decided which combination of shutter speed and aperture would give the correct exposure. They would then transfer these settings onto the camera and lens. This method of exposure setting is still followed on modern cameras that do not have built in meters.

Camera choice The range of cameras that are available is very large. The most important differences between them is in the way the meters work

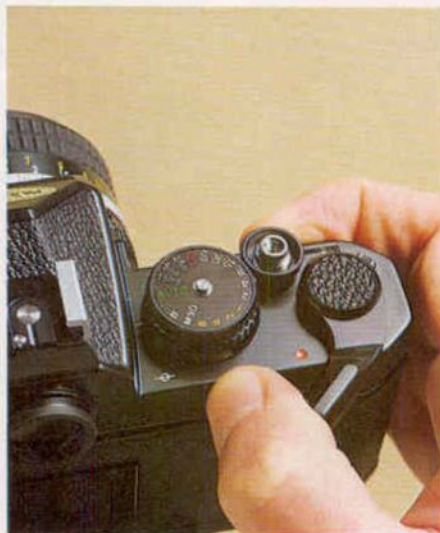
Whenever a photograph is taken, all these operations have to be performed, regardless of whether an automatic camera or a manual camera is being used. The difference is that, the more automatic the camera, the more functions it takes over from the photographer.

Aperture and shutter priority

Most of the SLRs that are now available offer some type of exposure automation, and these can be divided into two types: aperture priority automatics and shutter speed priority automatics (though some of the more expensive cameras can be operated both ways).

On a shutter priority camera, the photographer first sets the shutter speed that is required, the camera takes a light meter reading, and adjusts the aperture to give the correct exposure to the film. A typical shutter priority camera is the Canon AE1. On this camera, the user first sets the shutter speed on a dial on the top plate of the camera, and gently presses the shutter release. By looking through the viewfinder it is possible to see an aperture scale on the right hand side of the focusing screen, over which a needle swings. This scale indicates the aperture which will be set by the camera. The light pressure on the shutter release switches on the camera's exposure meter, which presets the aperture, and moves the meter needle.

Aperture priority-Nikon FE



1 Meter on The exposure meter is switched on. The switch for the meter on the Nikon FE is in the film wind lever, which is pulled out to switch it on



2 Set aperture On aperture priority cameras, the aperture ring on the lens is then set to the f-number that the photographer has chosen

Jon Bouchier

Foreground flowers Aperture priority automatics work well when depth of field is important. A small aperture was chosen here to keep everything in focus

When the shutter release is pressed right down, the aperture is closed down to the value chosen by the camera, and the shutter fires.

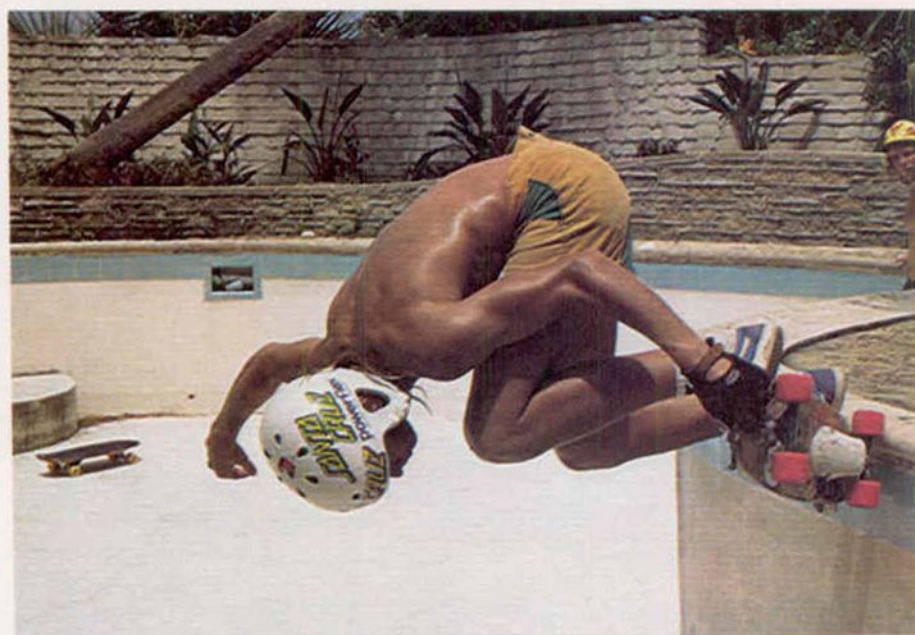
Because this type of camera allows the user to set the shutter speed that is needed, it tends to find favour with camera users for whom the shutter speed is the most important factor. Sports photographers, for example, need to know exactly what shutter speed is set on the camera at the time of exposure, because it is usually important that the subject of the picture will be 'frozen' in motion rather than blurred. The user of a shutter priority automatic gives up control of the aperture that is used, but for many purposes control over the aperture is less important than selection of the best shutter speed.

With aperture priority automatics, the situation is reversed. Instead of setting the shutter speed, the user picks the aperture, and the camera selects an appropriate shutter speed. The Nikon FE is a camera of this type. The sequence of operations for this camera begins with the user setting an aperture on the scale around the lens. The choice of aperture would usually be dictated by the depth of field required in the photograph (see page 30). Having set the aperture, the photographer looks through the viewfinder and pulls the lever wind backwards. This switches on the meter and moves a small needle in

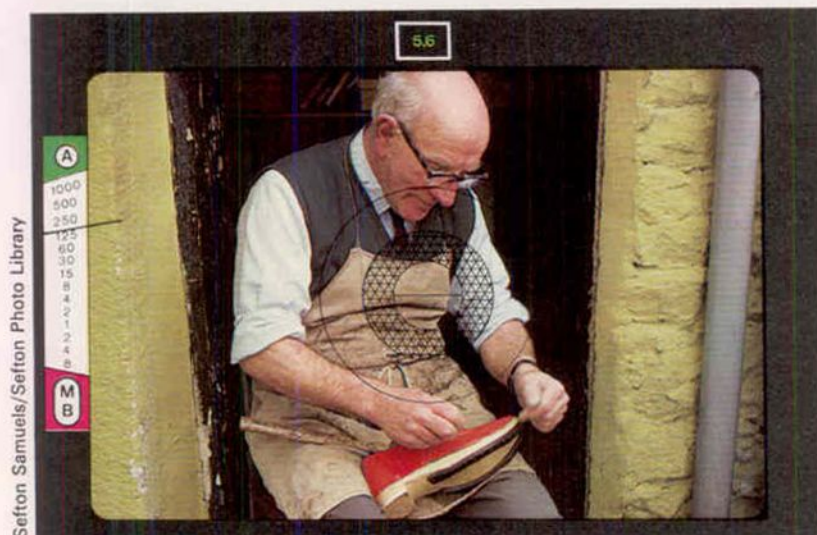
Speedy skateboard If the subject of the picture must be frozen in motion, a shutter priority automatic will be easiest to use



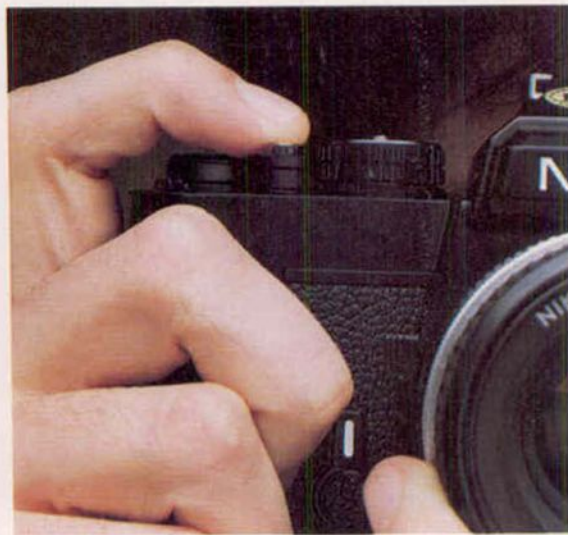
Trevor Wood



John Danzig



Sefton Samuels/Sefton Photo Library



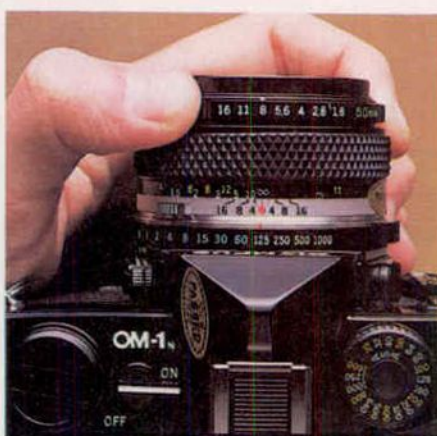
3 Viewfinder Looking through the viewfinder, a scale is visible on the left hand side of the focusing screen, on which shutter speeds are marked. A needle swings over the scale, and comes to rest at the shutter speed that will be set by the camera's automatic meter

4 Releasing shutter At the moment of exposure, the aperture closes to the f-number chosen by the photographer, and the shutter speed is set by the camera to give the correct exposure

Manual metering-Olympus OM1



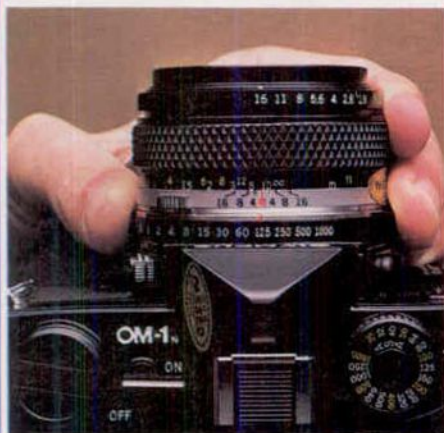
1 Meter on The Olympus OM1 has a separate meter switch. This must be operated before a light meter reading can be taken with the camera



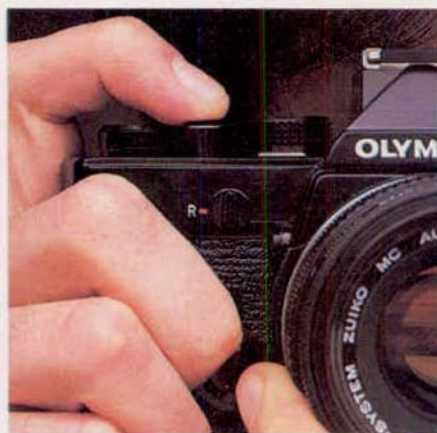
2 Set aperture In this instance, the photographer first sets the aperture to a value that will give sufficient depth of field for the subject



3 Viewfinder A needle on the left hand side of the focusing screen moves over a pair of marks. Exposure is correct when it is centred



4 Shutter speed In this case, the photographer adjusts the shutter speed to balance the meter needle. The shutter speed dial is around the lens mount



5 Release shutter After focusing and composing the picture, the shutter release is pressed. Both aperture and shutter have been manually set

the viewfinder to indicate the speed at which the shutter is going to operate. When pressure is applied to the shutter button the shutter will be released at the speed indicated in the viewfinder.

This system of operation is no better or worse than the shutter priority method, but is suited to a different type of photography, in which the aperture is considered by the photographer to be more important than the shutter speed. If a portrait is the subject of the picture, for example, the photographer must be sure that the whole of the model's face is in focus, so the aperture that is set is of great importance. Since the subject is unlikely to move very much, the shutter speed is less crucial.

Aperture priority automation is favoured by a lot of camera manufacturers, because the system requires fewer connections between the camera lens and body. To build a shutter priority automatic, on the other hand, some kind of mechanical linkage is needed between body and lens, to ensure that the correct aperture is set at the moment of exposure.

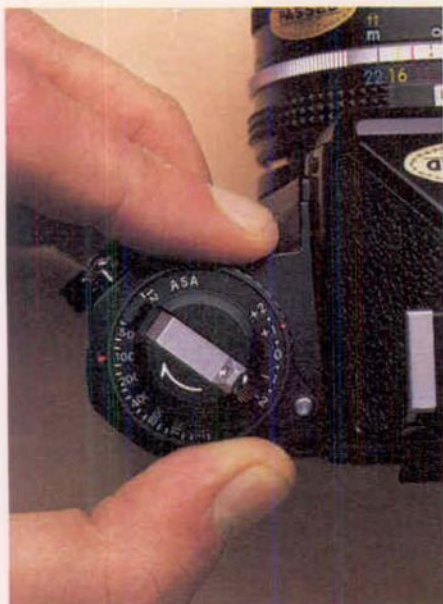
Manual cameras

Although shutter priority and aperture priority automatic cameras are the most common types, some other cameras fit into neither of these two categories. These are fully automatic cameras, and those which set the exposure without any intervention by the photographer—so-called 'programmed' cameras.

Manual cameras, such as the Olympus OM-1, have a meter needle visible through the viewfinder, but leave the photographer to do the work of changing the shutter speed and the aperture. To set the correct exposure on the OM-1, for example, the photographer first switches on the meter—on some manual cameras this is incorporated into the shutter release—and sets either the aperture or the shutter speed to the chosen value. Looking through the viewfinder, a meter needle is visible, and a pair of pincer-like claws. By adjusting either the aperture or the shutter speed, the photographer can bring the needle to rest between the claws—a position which indicates that the film will receive correct exposure. Over and under-exposure are indicated by the needle being too high or too low.

There are a number of variations on this method of exposure metering, which are similar in their method of operation, but which differ in the way that the meter reading is indicated. In the match-needle type of camera, there are two needles. Instead of lining up one needle between claws in the viewfinder, the photographer aligns the two needles to set the correct exposure. Over- and under-exposure are indicated by the needle being too high or too low.

This manual system of exposure sett-



Hans Feurer/Image Bank

Exposure compensation Backlit subjects require extra exposure, and some auto cameras have an exposure compensation dial to provide this facility

ing, while more time consuming than an automatic system, does allow the photographer full control of the aperture and shutter speeds that are being set, and for this reason is often preferred by professional photographers. It is also marginally cheaper to build into a camera, so is often found on the more inexpensive models in a camera range.

'Programmed' automation

This system, which is used in some of the more modern cameras, has a pre-programmed sequence of apertures and shutter speeds which will be set according to the lighting conditions. In the

Manual metering-Olympus OM1



1 Meter on Manual cameras can be used in two different ways. The procedure in this second example again begins by turning on the exposure meter



2 Set shutter Here the photographer is especially concerned that the right shutter speed is set, so he adjusts this control first



3 Viewfinder To centre the needle this time the photographer adjusts not the shutter speed control, but the aperture ring



4 Adjusting aperture Since the photographer considers the f-number to be of secondary importance, he can adjust it freely to balance the meter



5 Release shutter If the meter needle is between the claws, the film will receive the correct exposure when the shutter release is pressed

Jon Danzig

Edwoud Berne/fotogram

Jon Bouchier

Shutter priority-Canon AE1



1 Set shutter On shutter priority automatics such as this Canon AE-1, the first stage is to set the shutter speed to the chosen value



2 Half press release Gentle pressure on the shutter release switches on the camera and activates the through the lens exposure meter



3 Viewfinder A needle indicates the aperture which the camera has chosen. If this is off the scale, chose another shutter speed



4 Release shutter When the shutter button is pressed all the way down, the aperture is closed to the value selected by the exposure meter

brightest light, a fast shutter speed and small aperture will be set by the camera, and as more exposure is required, the camera will automatically change the shutter speed to a progressively slower setting, and open the iris diaphragm to a wider aperture. The photographer has no control over the speeds and apertures that are used. Although this system is fine for quick snapshots, it is of limited use for serious photography.

Manual override

Many automatic cameras have some sort of manual override, or compensation for unusual lighting. The most common example is the provision of a switch which allows the photographer to use the camera manually, in the same way as any non-automatic camera would be operated. Though this is a useful feature, many photographers find that automatic exposure gives perfect results for 98 per cent of their exposures, and they rarely take advantage of the switch.

The most common reason for wanting to change the exposure that the camera has set is because the subject is backlit, and so the automatic facility on the camera would produce underexposure. This is because the light meter usually averages the light reaching a certain portion of the focusing screen, and is unduly influenced by the bright light behind the subject. Early through the lens meters averaged the light from the whole frame, and produced serious underexposure in backlit conditions. Modern cameras are more selective—many of them have a meter that gives more emphasis to the centre of the screen—and so if the subject is central, backlit pictures will not be quite so heavily underexposed. Some cameras have a backlight switch which gives a one stop overexposure increase when pushed, and others have an exposure compensation dial, which allows the photographer to dial in a pre-set amount of exposure compensation. On cameras that lack either of these facilities, exposure compensation can still be made by changing the film speed set on the dial of the camera. By setting it to half the speed of the film in the camera, for example, one stop extra exposure will be given to the film.

A few cameras have what is described as a 'memory lock'. This is a switch or button, which locks the meter when pressed. If a backlit portrait is the subject of the picture, the photographer will move in close to the subject, take a meter reading from the model's face, depress the memory lock and then move back to recompose the picture before pressing the shutter release. The camera will give the correct exposure for the model's face, and ignore the backlighting. This system generally works well in practice.

Choosing an SLR is not simply a matter of picking the camera that has the most convenient automatic exposure system. In the next part we look at the other factors that will influence your choice.



Patterns

Wherever you look, the world is full of patterns—rows of trees, piles of boxes, veins on leaves—all of which can make beautiful pictures.

But they are not always easy to see

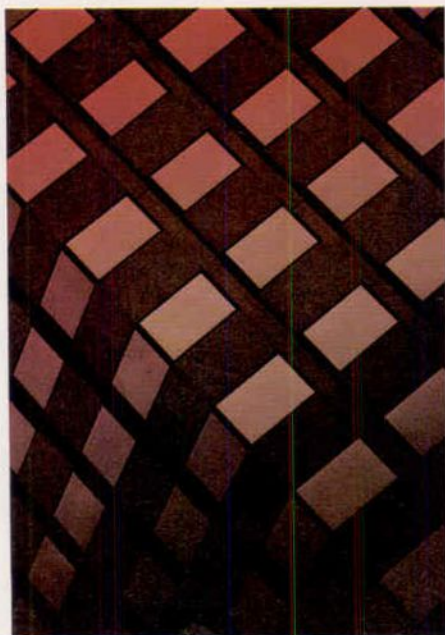


Georg Gerster/Magnum Photos

Many people tend to dismiss patterns as something they drew as children or as the design on household goods like wallpaper or china. But patterns are a strong visual element in all kinds of objects, both natural and man-made, and they can be used, often to stunning effect, by the creative photographer.

Pattern is essentially repetition—repetition of similar motifs or areas of similar shape, colour, texture or any other visual quality. There is no doubt that the eye is drawn strongly by patterns. Wherever there is a distinct repeated element in a picture, it tends to become the focus of attention and may compete with or even overshadow the main subject.

This effect is worth remembering because a strong pattern may upset the whole balance of a composition if it is included in the picture accidentally. More importantly, patterns can be a valuable creative element in a wide range of photographs. Or they may make fascinating pictures in their own right.



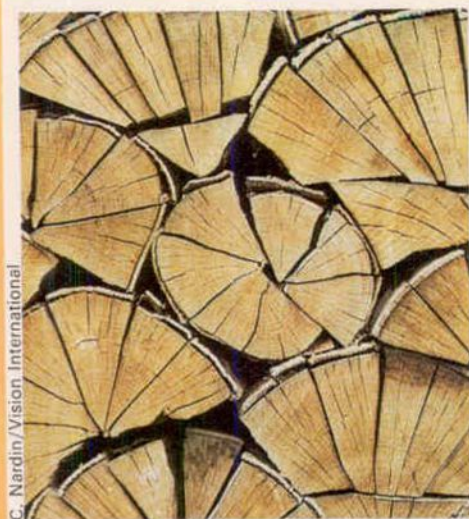
Corchella valley, California Look for patterns in farmland where crops are laid out regularly for easy harvesting

Office block A strange angle and a graduated filter turn an ordinary building into a fascinating pattern

One effect of patterns, for instance, is to flatten perspective. Unless there are suitable reference points, it can be difficult to judge distance on patterned ground in a photograph, and a strongly patterned floor may seem to float uncertainly in space. This effect can be used to create a rather dreamlike surrealistic quality in black and white. If the foreground of your picture consists only of strongly patterned ground such as a chequered pavement or linoleum squares, an isolated subject seems to hover in mid air—particularly a vertical format photograph.

A strong pattern may also bring life to an otherwise unpromising situation. Even

John Sims



C. Nardin/Vision International

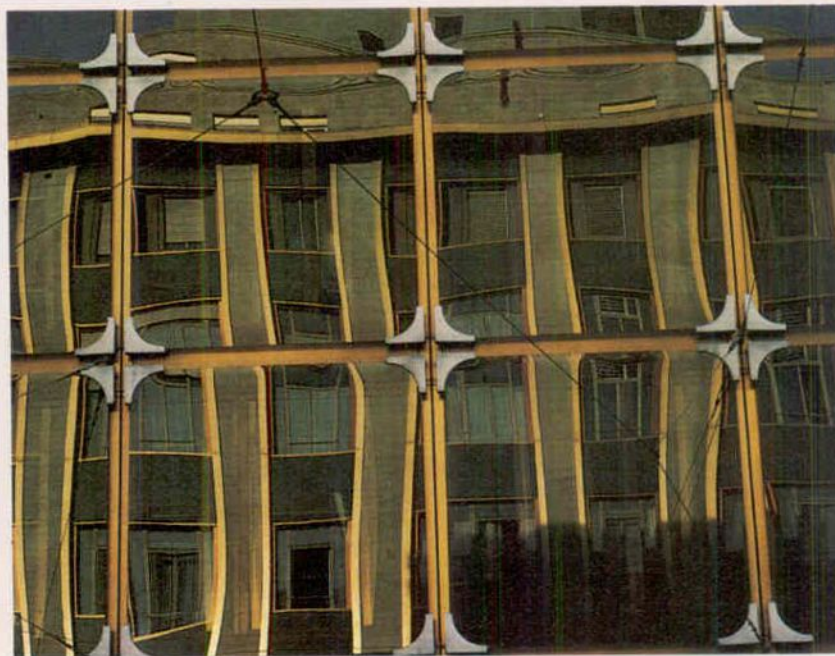


R. F. J. Parkhouse/Northern Picture Library

Logs A shot of the whole log pile might have been dull, but the photographer has found an attractive picture by moving in close. **Balconies** Buildings are full of patterns, but choose your viewpoint and the time of day carefully. **Spiral staircase** A popular subject given impact by framing that contrasts the pale radiating steps and dark curving rail. **Windows** Reflections lift a simple pattern out of the ordinary. **Tyre tracks** Imprints in sand need strong sidelight. **Colonnade** The photographer has not tried to include the whole arch, but concentrated on the pattern of the columns. **Village on the Niger, Mali** (right) From above all the world is a pattern—look out when flying



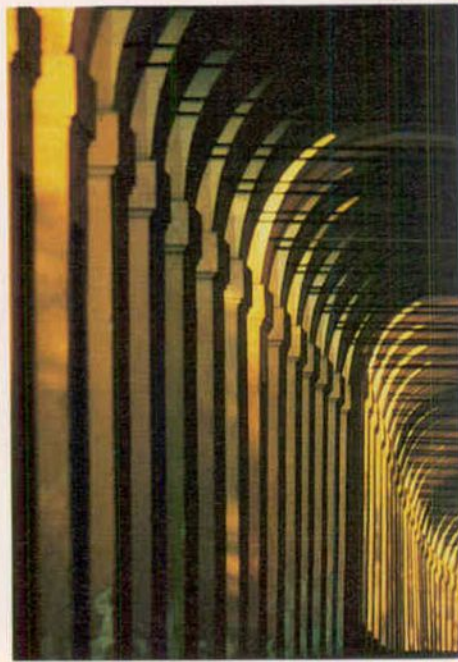
Rene Burn/Magnum Photos



John Sims/Vision International

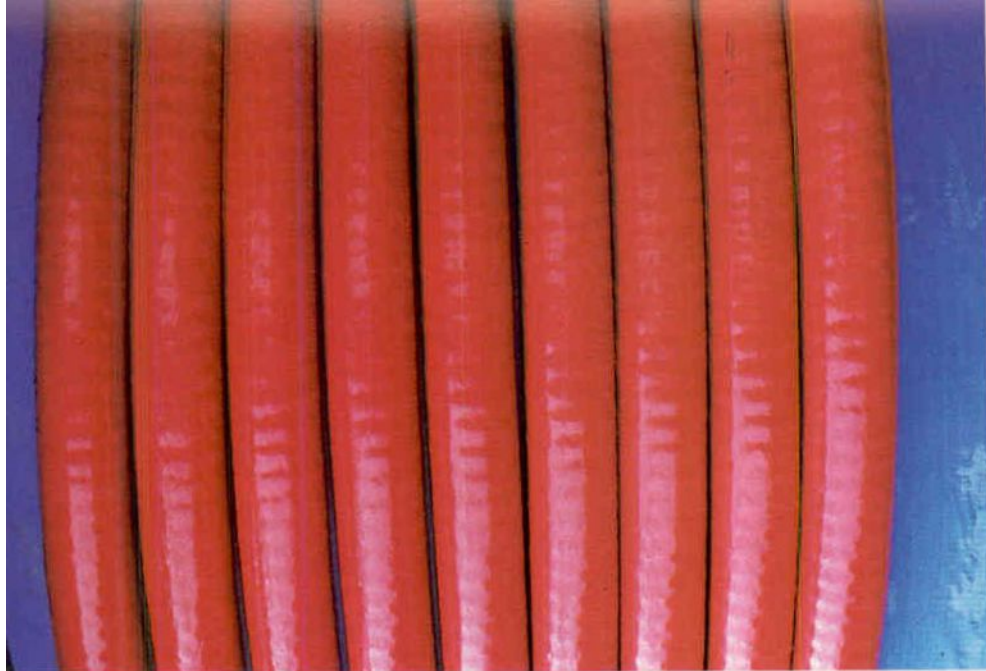


Klaus-Otto Hündt/Vision International



John Sims





Nick Boyce

the most mundane or difficult to approach scene can suddenly acquire a new dimension once you start to look for patterns. A pattern can often transform a dull landscape or an uninspiring interior into a fascinating design. An example will show how this can be achieved. In hill country with deep, narrow valleys it can often be difficult to get a satisfying composition. Move around though you might, the landscape never quite seems to fit into the frame in a pleasing way.

Standing high on the side of a narrow valley, for instance, the view is beautiful, but there seems to be only two photographic possibilities: either straight up

or straight down the valley, neither of which seem to be very promising. But there will often be very strong patterns on the opposite side of the valley, particularly if the country is closely farmed—a distinct break between the meadows and fields of the valley bottom and the rough pastures of the valley slopes, an intricate arrangement of walls and fences, regular rows of afforestation or simply a string of streams cascading down the hillside. Just as pattern tends to flatten perspective, then you can flatten perspective to bring out these patterns. With the camera pointed straight at the opposite side of the valley, perspective is flat anyway, but if you can use a tele-

photo lens, the effect is even more marked. Framing up square on the areas where the pattern is strongest may give an interesting and unusual shot that is just as evocative of the area as any broader panorama.

With this sort of picture, you have to forget about the normal way of composing landscapes in order to concentrate on the design. Often, for instance, trees or a gate or some other interest are included in the foreground to create

Umbrellas *Climbing above street level has given a viewpoint that reveals a colourful pattern, and soft lighting has retained the pale hues*



Edouard Berne/fotogram

Cables Strong colour contrast and a close viewpoint help to remove this reel of cable one step from reality and create a strong abstract pattern

Leaves Nature is full of beautiful patterns, but you may need soft lighting and slow film to retain full colours and fine textural detail

street lamps and other facets of the urban scene provide similar opportunities.

The ready made patterns of modern office and apartment blocks have always been popular subjects, but you can make them a little more abstract to bring out the pattern. Shoot from an unusual angle or photograph the reflection of the building in water or a window opposite—any distortion will add to the abstract nature of the pattern. In fact any view point that is slightly out of the ordinary helps to strengthen the impression of pattern. A roof top view, for instance, can make a fascinating picture, with the varied ranks of pitched roofs, chimneys and television aerials filling the frame. High contrast often brings out this sort of pattern best. Ancient hill villages with a cluster of tightly packed buildings basking in strong sunshine can make exceptionally photogenic patterns, their stark white walls contrasting with the angular areas of deep shade.

Some patterns are immediately obvious. Regiments of marching soldiers, railway sleepers disappearing into the distance or the rows of lights on the sea-front are difficult to miss. Other patterns are less easily seen, but can be found virtually everywhere.

Reflections Look for patterns on the water. Close in on the surface and try to exclude all distracting detail. Ripples, backlit for maximum contrast, can make lovely abstracts. So too can coloured can reflections distorted by water movement

Some patterns are only transient, like migrating birds gathering on telegraph wires, or ripples on the water. Others form just a part of a large object and may not be immediately recognizable. It is often worth scanning the scene with a telephoto and moving in close to single out a small pattern within a larger scene.

A rather mundane pile of logs may be very photogenic if you move in flat-on and frame only the pattern of the log ends. Similarly, brickwork may look far more interesting close up—the lines of mortar are far more interesting than the whole wall. Moving in even closer, the textured pattern of threads on sackings or the hairs on someone's arm can be similarly photogenic.

Although manmade artefacts are often characterized by regular arrangements, the natural world is full of patterns too. Natural patterns are far less predictable and can easily be missed. Some only appear at certain times of the year: some only look their best in certain types of light. Ripples of sand on the beach will only be obvious in strong side-lighting. A pattern of pebbles is shown to best effect in fairly diffuse lighting. And the pattern of waves on the sea will be at its clearest with strong backlighting to contrast one side of the wave to the other.

Patterns can be found everywhere. But because they are so common, it does not reduce their photographic value. It means that you can afford to be more selective, choosing lighting and viewpoint to bring out the design clearly and strongly. But above all it needs an eye for the unusual.



Lisa Mackson

depth or to frame the view. In a pattern picture, these are best excluded. Neither should you try to create a sense of perspective and balanced composition by framing a wide panorama with a dip in the relief placed near the centre of the picture. Try instead to create an almost abstract design out of the patterns in the landscape—the hedges, the little tracks, the rows of trees.

Very flat country is rarely inspiring photographically, but you can often create interesting effects by getting down low and concentrating on the pattern of the furrows, perhaps accentuating them with a wide angle lens. Look for the changes that take place as the agricultural year goes by. Each change may provide a new pattern—the planting of the seeds, the first shoots, the rows of young stalks, the arrangement of stooks after harvesting, and many others.

In the town, initially uninspiring scenery may have plenty of potential if viewed in terms of patterns. Treating the cityscape in the same way as the landscape, you can close in on rows of terraced houses with a telephoto, foreshortening perspective and emphasizing their regularity. Rows of windows, chimneys on houses, tall factory chimneys,



David Gallant





Selecting an SLR

Before buying a camera, decide exactly what it will be used for most. It is pointless owning a sophisticated SLR if you never use it to the full



Jon Bouchier

For most serious amateurs the first choice of a camera is a single lens reflex, or SLR. So much effort and innovation has been put into the development of this type of design over the last 20 years that the facilities that can now be found on a good SLR are unparalleled. Indeed, these cameras have so much to offer that it is extremely difficult to know where to begin when trying to decide which one to buy.

Ease of handling

As most SLRs are very compact and all controls are fitted into a small space, it is important that they are easily accessible. It is no good having an enormous range of facilities if you cannot alter the various dials and switches without going to a lot of trouble. Most manufacturers are aware of this and design their equipment carefully, but when trying to select the most suitable camera it is as well to handle the various models before you buy so that you can find out whether all the controls are easy to use.

Weight

Most 35 mm SLRs have a basic body weight in the range 500 to 600 g, approximately the weight of three average size paperback novels. This does vary from

Camera choice *There are so many cameras on the market that choosing an SLR is no longer an easy matter*

model to model but most SLR cameras are now quite a lot lighter than the models of a few years ago.

Clearly a very light camera is the most suitable for a photographer who intends to use it hand-held for long periods, as in the coverage of sporting events. Photographers who pursue energetic hobbies—like walking or climbing—will also find that small cameras take a load off their shoulders. With photographic work where the stable support of a tripod is likely, such as bird photography, the weight of the camera is a much less important consideration.

Compactness

Since Olympus introduced their OM-1 model, the first of a new generation of smaller SLRs, most manufacturers have tried to make their cameras as small as possible. Given the fixed size of the film, lenses and reflex viewing system used by SLRs, however, a further significant miniaturization of overall size seems unlikely.

Clearly a small camera is easier to carry than a larger one, but, as already

indicated, tiny cameras can be difficult to operate. If you do not have nimble fingers and do not feel the camera size to be of overriding importance, it would be more sensible to go for a slightly larger model.

Robustness

It is an easy matter to measure the dimensions of a camera or to weigh it, but judging the robustness of a camera is a different matter. Just because a camera is heavy and looks solid does not mean that it will stand up to rough treatment. A poorly engineered bracket or hinge will fail whatever its dimensions. The only practical way of judging robustness is by reputation, and the fact that professionals who do demand a lot of their equipment have tended to buy Nikon or Canon is something of a guide.

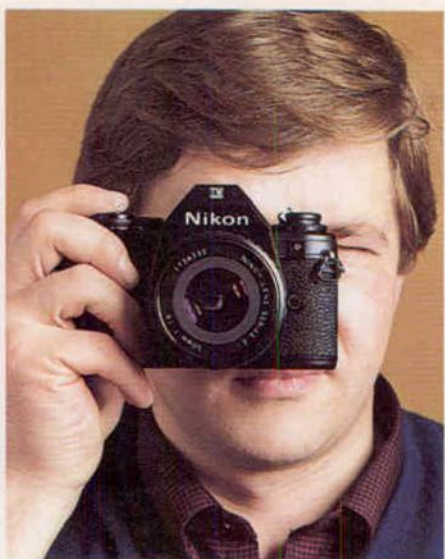
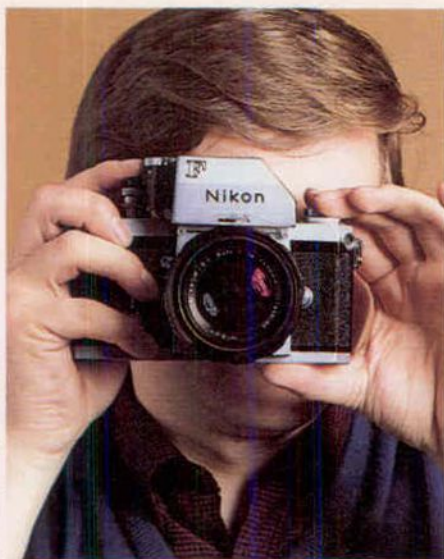
Lightness is often achieved by the increased use of plastics and thinner castings—in most cases this reduces the strength and resilience of a camera.

Few amateurs, however, need equipment that will withstand a great deal of wear and tear. Only if you enjoy exotic locations or go in for a strenuous hobby, such as free-fall parachuting, will you really need such a rugged SLR.

Cameras are often sold complete with a standard lens. In the case of 35 mm SLRs this means one of either a 50 mm or 55 mm focal length. Such a lens gives an image that closely resembles the way the human eye views the scene.

There is usually a choice of several standard lenses, which normally have maximum apertures of $f/1.4$, $f/1.8$ or $f/2$. The first of these has the largest maximum aperture, and will be the most expensive. However, choosing a good standard lens purely on the basis of price will not necessarily result in the model that produces the best pictures. An $f/1.4$ lens may well cost twice as much as an $f/2$ lens, but when used at full aperture, the $f/2$ lens will probably produce better pictures. It may seem surprising then, that people are prepared to pay more for wide-aperture lenses.

The reasons are simple—if a lens has a wide maximum aperture, it gathers a lot of light. This means the focusing screen is brighter, and focusing more accurate. Also, in dimly lit conditions, more light will get to the film and it will be possible to use a faster shutter speed with a lens that has a wide maximum aperture. These advantages make such lenses attractive to photographers who need fast shutter speeds, and who often shoot pictures in bad light—candid photographers, for example, frequently need lenses with



Old and new Most modern cameras are much lighter and less bulky than their predecessors. The larger one shown here was made in 1973

distant detail. Many of these lenses are not only expensive but of limited use, and their availability is only relevant if you have a specialist application in mind. For example, if you are interested in wildlife photography, a comprehensive range of telephoto lenses could be most useful.

The shutter

All 35 mm SLRs use focal plane shutters (see page 84). These shutters are placed right in front of the film and controlled either mechanically or electronically. Mechanical systems usually have twelve speed steps from 'B' (which means that the shutter stays

wide maximum apertures.

Unless you are convinced that you need the extra light-gathering power of a lens with a wide maximum aperture, it is a better idea to buy one with a more modest specification, and save your money to buy film.

In the quest for more compact cameras, lens design has now followed the lead of camera bodies. Fortunately, mass-production has ensured that these lighter lenses are not significantly more expensive than older, more bulky, types.

Some manufacturers offer two ranges of lenses. The smaller lenses are mechanically less rugged, and optically different from their heavier counterparts, but the results that are produced with a compact lens from a reputable manufacturer should be every bit as good as those from a bulkier lens.

The lenses for most SLR cameras are fitted with a bayonet mount—a simple twist and lock action mounts the lens on the camera body. In the past, many cameras used a screw thread to mount the lens on the camera, and this at one time was almost universal. Though there are many secondhand cameras and lenses of this type available, only one or two manufacturers now use the screw thread method of lens fitting on their current models.

The disadvantage of the bayonet system is that it is far from universal. Although a few manufacturers share the same mount, it is generally impossible to use the lenses from one maker on the body of another. Independent manufacturers make lenses with a variety of mounts, so choice is not limited to lenses made by the manufacturer of your camera (see box).

One thing that has improved enormously with the development of the modern SLR is the range of interchangeable lenses. All the major manufacturers offer a comprehensive selection ranging from 6 mm fisheyes—that gather everything in front of the camera into one circular image—to 2000 mm mirror lenses that act like telescopes, magnifying the smallest

Interchangeable lens mounts

The manufacturers of SLR cameras usually take a very independent approach to the development of their new models. Nowhere is this more obvious than in the design of lens mounts. Most camera manufacturers have adopted a unique way of fitting lens to camera, that is used by no other company. In recent years, though, there has been some degree of co-operation between companies, and a few cameras share the same mount.

On the other hand, some manufacturers have developed their own bayonet mount, and then found that it limited the further development of their cameras, so they introduced a second type of bayonet mount. A range of models from one manufacturer has used no less than three different systems of coupling lens to camera!

When buying an SLR, remember that independent lens makers—those who do not also make cameras—also supply lenses in a number of fittings. Make sure that the camera you want has lenses available from sources other than the camera manufacturer, or you may find that your choice is very restricted.

Pentax, Cosina, Chinon, Ricoh and

Topcon all use the Pentax 'K' bayonet mount that is quickly becoming a standard fitting. A lens from any one of these manufacturers will fit the body of any other, and the camera will work perfectly. Topcon, however, also use a different unique bayonet on their Super DM model.

Cóntax and Yashica use the same lens mount. Lenses are freely interchangeable. Rollei and Voigtlander also use the same mount as each other—so both brands can share the same lenses.

Zenith, Praktica and Alpa all use the 42 mm 'universal' screw thread, not a bayonet, on their cameras. Alpa use a unique bayonet on one of their models, and Praktica, similarly, employ a unique bayonet fitting. To complicate matters still further, Praktica also have another system—electrical coupling. This feeds information from lens to camera, so some of their lenses, and one of their cameras, have electrical contacts fitted to the screw thread fittings.

Mamiya use two separate, non-interchangeable bayonet lens mounts and all other manufacturers, including Canon, Nikon, Olympus and Minolta, use exclusive bayonet lens mounts.





Wide aperture Standard lenses with wide aperture are not always better. This picture was taken with an f/1.2 50 mm lens at full aperture. Definition is poor—look at the digital clock

open as long as the button is depressed) through one second, $\frac{1}{2}$ second and so on up to $1/1000$ second. The mechanism is controlled by either a dial on the top plate or a ring on the lens. The dial is marked not with fractions, but with numbers— $\frac{1}{2}$ second is marked as 2, $\frac{1}{4}$ second as 4 and so on to 1000. This series of steps is also used in those electronic exposure systems that give shutter speed priority. A few aperture-priority automatic cameras have no shutter speed dial. Since these cameras are designed to be used automatically at all times, the lack of a manual shutter speed control is not a great problem. If you require control over the shutter speed, however, it is highly unlikely that you will have much use for a camera of this type.

Viewfinder and focusing screens

The incorporation of more and more electronics into the camera and the use of the viewfinder to display information has concentrated attention on this part of the camera. Some manufacturers produce cameras that have easily interchangeable viewfinders. The normal eye level pentaprism can be exchanged for a finder that can be used at waist level, or one that gives a greatly magnified image which is useful for copying work. As such viewfinders are intended for special purposes it is easy to decide whether or not their possible applications will interest you.

Although a standard focusing screen is suitable for most applications, many cameras accept interchangeable focusing screens, even if the viewfinder itself is fixed. While this used to be a feature found only on the most expensive cameras, it is now available even on quite cheap ones. The screen fitted as standard to many cameras may have several focusing aids—usually both microprisms and a split image rangefinder—and the screens that are available as alternatives differ from one manufacturer to another.



Some cameras accept screens that have no focusing aids at all, while others have microprisms all over. If you have very special interests, and want to take photographs through microscopes, for example, you may need a special screen.

Since the range of screens available varies so much from one company to another it is a good idea to check details of the more unusual screens with a camera salesman, who should be able to explain what is available to fit the camera that you are considering buying. For most applications, though, a standard screen is quite satisfactory.

Viewfinder information

Most cameras have some information in the viewfinder about the shutter speed or aperture that has been set. Some have a great deal more information, such as the number of frames of film that have been used, or whether the camera is set on manual.

This information is passed on to the photographer in a number of ways. There may be a scale of apertures down one side of the screen. A small LED lights up alongside one of these to indicate the aperture in use. An alternative is a needle which swings across a scale and comes to rest alongside the



Better quality An f/1.7 standard lens produced much better results, but a longer shutter speed was necessary. The lens was only half the weight of the f/1.2 equivalent, and a third of the price

aperture or shutter speed that has been set by the photographer.

A more direct method of indicating the aperture is a device which is sometimes called a Judas' window. This looks like a tiny window at the top of the viewfinder image, through which the photographer can see the aperture setting ring. Though this works well with lenses made by the same firm that made the camera, lenses made by other companies may not have the aperture ring in the same place, and no indication of aperture will be visible.

Viewfinder information systems work well in average conditions, but when buying a camera it is a good idea to see whether the settings are visible both in very bright light (point the lens at a bright shop spotlight) and in very dim light, or when the subject is very dark in colour.

Some photographers prefer an uncluttered viewfinder, and like to have the bare minimum of information visible.

Hot shoes and flashguns

On top of the viewfinder most manufacturers provide a slide-on connection, a *hot shoe* or *accessory shoe*, for one of the small electronic flashguns currently available. The built-in contacts link the gun to the camera and fire the flash at the moment when the shutter is open. Because of the way the shutter works, it is not advisable to set a faster shutter speed than $1/60$ or $1/125$ while using a flashgun (see page 85). On the more sophisticated electronic cameras the use of the hot shoe automatically programs the shutter to fire at one of these speeds.

Some electronic cameras that have so-called dedicated flash capability can provide even more sophisticated couplings between camera and flash. For example, some cameras will operate at the correct synchronization speed for flash only when the flashgun is ready to make an exposure. If it is not, the camera will revert to the normal automatic mode of working, and will make an exposure

Interchangeable screens For special uses, you can change the focusing screen of some cameras. This is often fiddly, and sometimes needs tweezers

using available light. Such cameras often have a 'flash ready' indication visible in the viewfinder, and some also have a 'confidence light' that comes on if the subject is within the range of the flashgun.

It is probably clear from this description that a few dedicated flash systems are extremely sophisticated. When buying an SLR, it is as well to think carefully about whether you are likely to need this degree of complexity. Sophisticated dedicated flashguns are more expensive than the more ordinary types, and the extra expense may not be justified unless you have special requirements.

Motor drives and winders

The first time that you use a camera fitted with a motor winder or autowind, the feeling is very seductive. There is no need to do anything but press the shutter release—all the winding on is done for you. In fact such units can create a different approach to camera handling, because you never have to move your eye from the viewfinder. This is particularly true if the motor is coupled with fully automatic exposure control. The disadvantage is that it is easy to take frame after frame indiscriminately without concentrating hard enough on getting the 'decisive moment'.

Motor winders are easy to attach: they are usually screwed into place on the camera base plate. They are powered by a set of batteries fitted into a compartment in the winder. The speed of winding on is usually about 2 frames a second. Not all cameras can be used

Bayonet mounts Except on a few cameras, lenses are changed by a bayonet mount. The twist and lock action is quick and positive



Peter Dazeley/Camera lent by Pelling and Cross

with an autowinder, and if they can, only a unit made for a particular camera will fit. Autowinders are not interchangeable between different makes of camera.

A few cameras have two different types of motor available—a simple, inexpensive motor winder, and a more sophisticated unit called a motor drive. Since the two motors often look very similar, it is difficult to see why the drive is twice or three times the price of the winder. The reason is twofold—speed and robustness. Motor winders usually operate quite slowly in comparison to drives, some of which can run a roll of 36 exposures through a camera in three and a half seconds. Such high speed operation demands more heavily built components and more complex and sturdy mechanisms.

Since motor drives are made to professional standards, and should run many thousands of rolls of film without

trouble, they are clearly going to be expensive. Unless you need really fast operation, then you are unlikely to need the sophistication offered by a motor drive, and an autowinder would be adequate.

Other features

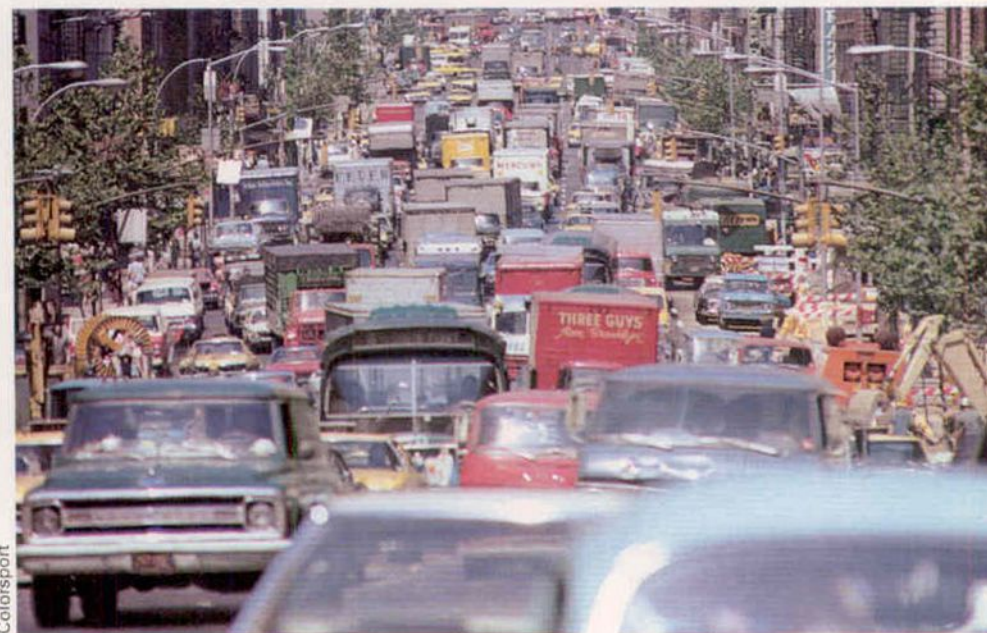
A few cameras have a mirror lock—the mirror that reflects the image on to the focusing screen can be locked in the 'up' position. In practice, this feature is of little use for everyday photography, but some photographers like to lock up the mirror to reduce vibration. This procedure blacks out the viewfinder screen. The facility is of greatest value when using very long focus lenses or photographing through telescopes, where any vibration is undesirable.

A self timer, or delayed action, gives about a ten second delay before the shutter is released, and this allows the photographer to get into the picture. It is



Peter Dazeley/Camera and drives lent by Pelling and Cross

Telephoto traffic The greatest advantage of using an SLR is the ability to use interchangeable lenses. A telephoto lens was used for this shot



Colorsport

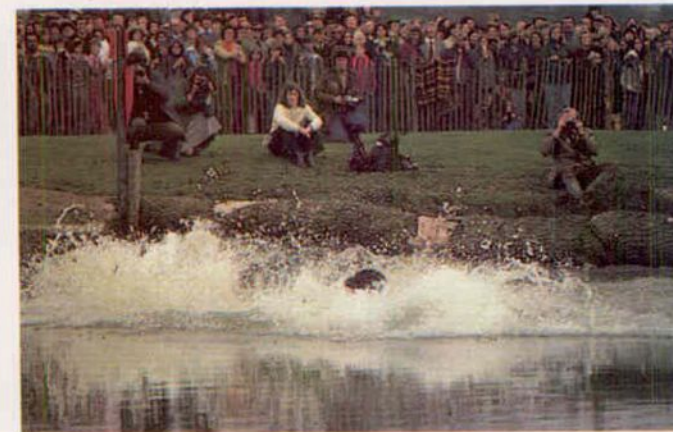


Colorsport



Peter Dazeley

Motor drives Professionals often use costly motor drives (attached to camera) to catch action like this, but an autowinder (alongside) is adequate for most purposes



also useful for damping down vibration, as the photographer's finger is not on the shutter release at the moment of exposure. In this respect it is useful if you are using the camera on a tripod, and you do not have a cable release with you.

Exotic extras

Those cameras designed for professional use are the basic units of entire systems intended for use in special situations. Underwater housings and radio-controlled shutter releases can look very glamorous to those unacquainted with them but you should remember that they are all intended to do specific jobs. The purchase of such equipment, which is often very expensive, should only be contemplated if you are absolutely sure that you are going to use it for quite a while. If you want to try some-

thing out, then the nearest big city will usually have a company specializing in photographic equipment hire. The availability of such items, which you may rarely or never use, should never be allowed to colour your judgement as to the camera that you buy.

Making a selection

When trying to decide which camera to buy, first sort out those areas of photography that interest you most. If you are not sure, you may have to purchase equipment that is flexible enough for use in a variety of situations. But if you are only interested in taking portraits of friends, or landscapes, you will only need simple equipment.

Once you have narrowed the area of choice a little, get some brochures on the cameras in which you are interested. Try to ignore the sales talk as much as

possible and concentrate on the facts. Publicity leaflets have technical data pages where the hard information is collected. If one particular aspect is emphasized by the manufacturer and seems impressive, ask yourself whether it is of any advantage to you. A shutter that works at 1/2000 of a second is of little use if your interest is architecture. However, a good motor-drive facility and a well matched range of zoom lenses may be just what a budding sports photographer is looking for.

Once you have narrowed the choice, go into a shop and try out the cameras on your short list. Do not let the shop staff try to hurry you into an inappropriate selection. Whatever your choice, you will have to use the results of that decision for quite a while. A few hours consideration may save frustration in the years to come.



Pioneer of photography

Although Fox Talbot did not take the first photograph ever, his discoveries were central to photography as we know it today. His pictures are a unique and fascinating record of the early Victorian era

William Henry Fox Talbot was not the only man to invent photography, or the first, but he was among the pioneers.

The supreme contribution of his genius was in evolving the negative-positive principle that we still use today to make as many prints as we want from one negative picture. His other inventions, too, helped photography take great strides forward towards today's fast films and papers.

The principle of the camera was known to eleventh century Arabian scientists and to Renaissance artists, and the chemical basis of photography was known to an Italian experimenter in 1614. But it took another 225 years for the knowledge to be turned into a practical proposition by the genius of Fox Talbot, an Englishman.

In the years preceding Fox Talbot's momentous discoveries, other researchers had been working towards creating a photographic image. In the late 1700s, Humphry Davy and Thomas Wedgwood were experimenting with the blackening effect of light on certain chemical compounds of silver. In 1824, the Frenchman Nicéphore Niépce made use of the way that sunlight hardens bitumen to produce the world's first photograph of the view from his farmhouse window. And in the 1830s another Frenchman, Louis Daguerre, made the first of his famous daguerreotypes. But the daguerreotype, like Niépce's bitumen picture, was incapable of being reproduced simply. It was not until 1839 that Fox Talbot, after months of experimentation, announced the photographic

process as we know it today—the negative-positive process, by which an infinite number of positive prints can be photographically reproduced from just one negative image.

Unlike Niépce, who had been searching for a way to enhance his family's commercial interest in lithography, or Daguerre, who was a theatre set designer looking for a way to make stage scenery more realistic, William Henry Fox Talbot was more of a scientist and scholar, interested in knowledge for its own sake. Simultaneously with his researches into photography, he also won eminence in Assyriology, Hebrew, hieroglyphics, etymology, mathematics, electricity, astronomy, crystallography, botany and microscopy. His achievements were profound, but rather than courting fame by publishing academic papers, he found joy enough in the satisfaction of his studies. Until it became necessary for him to publish his discoveries in the face of competition from rival researchers, he contented himself by communicating them only to his scientific friends.

Fox Talbot was born on 11 February 1800, the son of William Davenport Fox Talbot, a captain in the Dragoons who died only six months later, leaving the family estate of Lacock Abbey deeply in debt. To pay off the debts, Fox Talbot's mother, a woman of great spirit and determination, had to lease out the estate. With her son and her second husband she then led an unsettled life until their return to Lacock Abbey 27 years later.

This loving and demanding mother spurred young Fox Talbot's intellectual curiosity from a very early age. From boarding school at Rottingdean he wrote home to her at the age of nine: 'I have never missed being very, very good in the Abbé Monchel's report although every other boy has missed it sometimes.' At Harrow he was put into more advanced classes several times so that, at the age of 15, he had to wait three years before entering Cambridge. Once there he won acclaim for translating Shakespeare's *Macbeth* into Greek and graduated with first class honours in mathematics. In the years after Cambridge, he was elected to the Royal

Daguerreotype of Fox Talbot taken in about 1844 by Antoine Claudet. A Frenchman living in London, Claudet took daguerreotype portraits under licence from Daguerre. Talbot was a friend of Claudet's and sometimes used his studio for taking his own photographs



Fox Talbot Museum, Lacock



The 'mousetrap' One of the very small experimental cameras that Talbot used between 1835 and 1839. It is only about 75 mm wide

Kodak Museum

complicated forms and outlines'. He sent these 'photogenic drawings' (literally, drawings 'made by light') to his relatives, but as he had not yet found a way to fix the images permanently, the pretty patterns soon disappeared.

Talbot had heard from Humphry Davy, now Sir Humphry, that silver iodide was even more sensitive to light than silver chloride. So, disregarding the problem of image-fixing, he set about experimenting with silver iodide to try and lessen the 'photogenic drawing' exposure time of several hours. 'Great was my surprise,' wrote Talbot, 'to see that the iodide was not only less sensitive than the chloride, but that it was

not sensitive at all to light.' So here, after all, was Talbot's fixing agent. After making his 'photogenic drawing' on chloride paper he would be able to fix the image by changing the silver chloride into silver iodide.

Unfortunately, Talbot did not know that the process he used to make the silver iodide would cause the 'photogenic drawings' to fade slowly over a period of years, even though they faded at a slower rate than the previous overall darkening of silver chloride pictures.

Early in 1835, Talbot found a way of making his paper far more sensitive to light than even in his first great dis-

Astronomical Society where he already knew Sir John Herschel, the chemist and astronomer. This friendship was later to prove very valuable to his advances in photography. He was also elected to the Royal Linnaean Society for natural history and to the Royal Society itself.

All these honours came to Fox Talbot before he had even conceived the idea of experimenting with what was later to become known as photography. It was only in 1833, when he was aged 33 and on honeymoon in Italy with his wife Constance, that he found his sketching inadequate to cope with the beauties of Lake Como and fantasized about 'how charming it would be if it were possible to cause these natural images to imprint themselves durably and remain fixed on the paper'. He was thinking of the *camera obscura* (literally, a dark room), a box with a lens which projected an image on to a piece of paper fitted to one of the sides, which was used as an aid to sketching.

Immediately, he set about making notes of the experiments he would make towards realizing this fantasy when he returned to Lacock Abbey, now his home again. He already knew of the experiments of Humphry Davy and Thomas Wedgwood, and he reasoned that if an object were placed on a piece of good quality writing paper that had been impregnated with silver nitrate, only the exposed area of the paper would become darkened by sunlight.

Silver nitrate paper was not sensitive enough to light, but by experimenting with different proportions of silver nitrate and common salt (sodium chloride) he achieved a paper of far greater sensitivity. What he had done was to produce a silver chloride which was far more sensitive to light than the silver chloride produced by other methods.

Not only did this represent a great step forward in photography but it also represented a great scientific discovery. It had previously been thought that the behaviour of silver chloride was unchangeable, no matter what process was used to manufacture it.

By the summer of 1834, Fox Talbot had managed to produce 'distinct and very pleasing images' of such things as leaves, lace, and other flat objects of

Mary Evans Picture Library



The Reading studio These two pictures show the activities at Talbot's business premises—copying paintings, portraits, printing negatives

Early box cameras (Left) A simple box with sliding lens (Centre) Using a similar principle, this camera also tilts up on a rack (Right) A slightly more complex camera with a glass screen

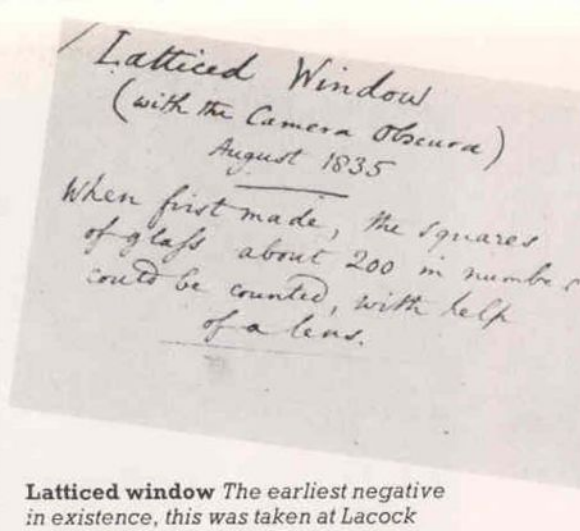


Science Museum

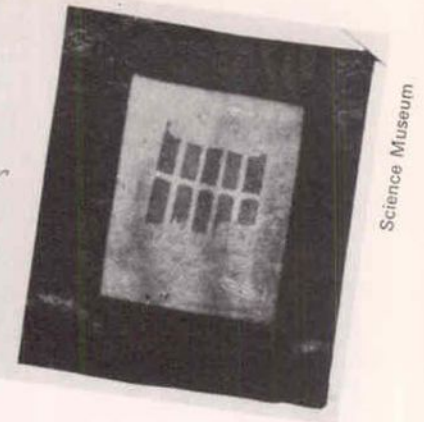


covery. This supersensitive paper was produced by washing it alternately in solutions of common salt and silver nitrate, as yet another way of producing silver chloride. The paper was sensitive enough to be used in the relatively low intensity light of Talbot's solar microscope to produce photographs of sections of plants magnified eleven or twelve times. And, at about the same time, he hit upon the idea of using a strong solution of common salt as the fixing agent, far better than the imperfect iodide method.

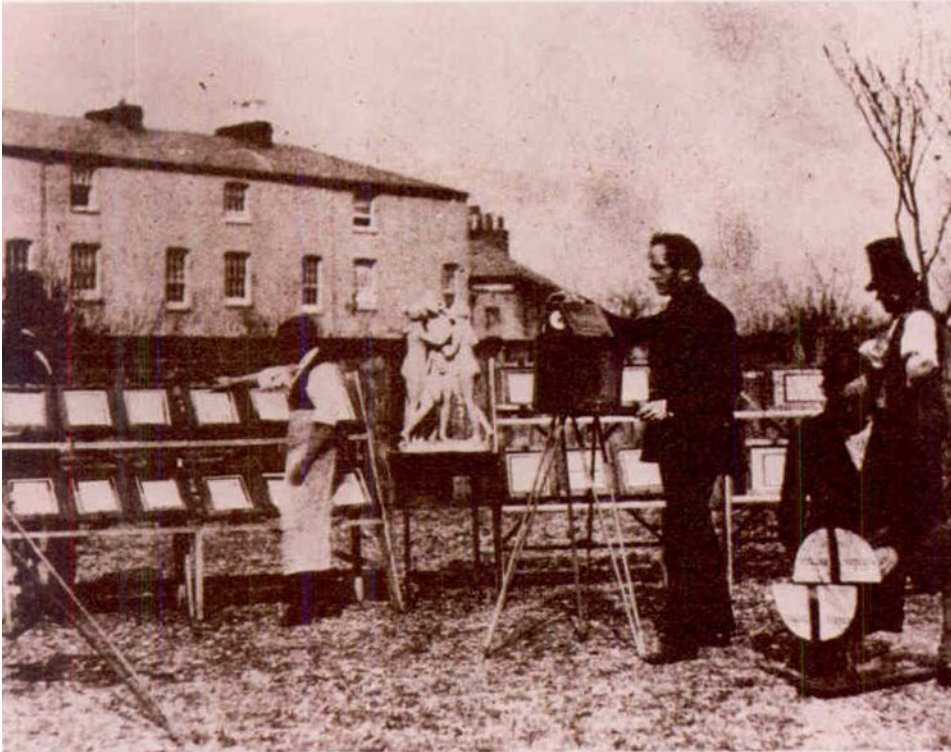
After this, he was to use this paper to produce the invention for which he is remembered as the true father of



Latticed window The earliest negative in existence, this was taken at Lacock



Science Museum



modern photography.

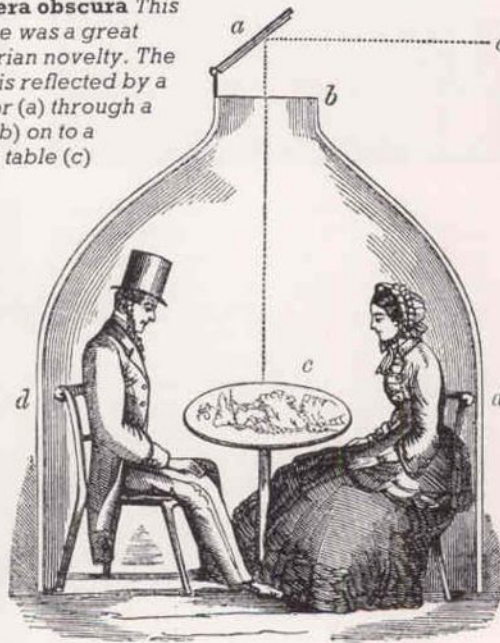
Until that time, all of Talbot's photographs had been negative images, but with the supersensitive paper he deduced that he would be able to make contact prints with positive images: '... the first drawing [Talbot meant 'photogenic drawing'] may serve as an object to produce a second drawing in which the lights and shadows would be reversed ...' It was Sir John Herschel who called the first picture the 'negative' from which 'positive' prints might be taken, and coined the word 'photography'.

In the summer of 1835, Fox Talbot and his wife returned to Lacock Abbey from a brief stay in London where their first daughter, Eliza Theresa was born. Talbot then constructed his first camera, truly a box camera, as it was 'a large box, the image being thrown upon one end of it by a good object glass (a lens) fixed in the opposite end.' Even with the supersensitive paper, his first photograph, of a

Photogenic drawing Made in about 1839 by placing a leaf frond on sensitized paper and exposing it to light for several hours

Kodak Museum

Camera obscura This device was a great Victorian novelty. The view is reflected by a mirror (a) through a lens (b) on to a white table (c)



Mary Evans Picture Library

Royal Photographic Society



building 'suitably illuminated by the sun', needed an exposure of 'an hour or two'. But 'a little experience in this branch of the art showed me that with smaller *camerae obscurae* the effect would be produced in a smaller time.' So he had several smaller boxes made, each with lenses of shorter focus, and these gave him 'very perfect but extremely small pictures'.

On account of their small size, as little as 75 mm in width, Constance Talbot referred to these cameras as 'mousetraps'. In September 1835 while holidaying in the Isle of Wight with her baby daughter, she wrote to her husband who was planning a trip to Wales: 'Shall you take any of your mousetraps with you into Wales? It would be charming for you to bring home some views ...'

From about the same time comes the earliest negative still in existence. It is of the oriel window at Lacock Abbey, taken from the inside. Talbot



Patrick Thurston

Lacock Abbey, Wiltshire is now open to the public in the summer and the Fox Talbot museum is housed in the nearby tithe barn, where there is a permanent exhibition of his work. Fox Talbot took many pictures of his family grouped on the lawn in front of the house

Farm labourer One of a series of photographs that Fox Talbot took of the farm labourers who lived in and around Lacock in the mid 1840s

Family group at Lacock Abbey The group includes Fox Talbot's wife, Constance, and his assistant, Nicolaas Henneman, who were both photographers in their own right. They both also contributed many ideas while Fox Talbot carried out experiments



Fox Talbot Museum, Lacock

pasted it on card with a note that: 'When first made, the squares of glass, about 200 in number, could be counted with help of a lens'.

For the next four years Talbot contemplated the philosophical significance of his discoveries, and occupied himself with his other studies. But the ambitious Daguerre had meanwhile been forcing the momentum of his own amazing invention in Paris, and made a public announcement, without giving details, on 7 January 1839, saying that he could use the *camera obscura* to make exact and permanent pictures. Fox Talbot had no idea of the nature of Daguerre's invention—it might have been precisely the same as his own. He could not have been comforted by a

letter from Herschel in Paris, who said of daguerreotypes: 'It is hardly saying too much to call them miraculous. Certainly they surpass anything I could have conceived as being within the reasonable bounds of expectation ... His times (of exposure) also are very short ... In scenes of great detail every letter in distant inscriptions is reproduced and distinctly recognizable ... Excuse this exultation.'

Daguerre's invention, however important, was of a completely different nature and could do nothing to detract from Fox Talbot's own momentous invention of the negative-positive method. Together with Herschel's suggestion that he use hyposulphite of soda as a fixing agent, it immediately



prompted him to start experimenting again, and to publish his own results. Just six weeks after Daguerre's jubilant but guarded announcement, Talbot's paper, *An Account of the Processes employed in Photogenic Drawing*, was read before the Royal Society and so became the first published account of any photographic process.

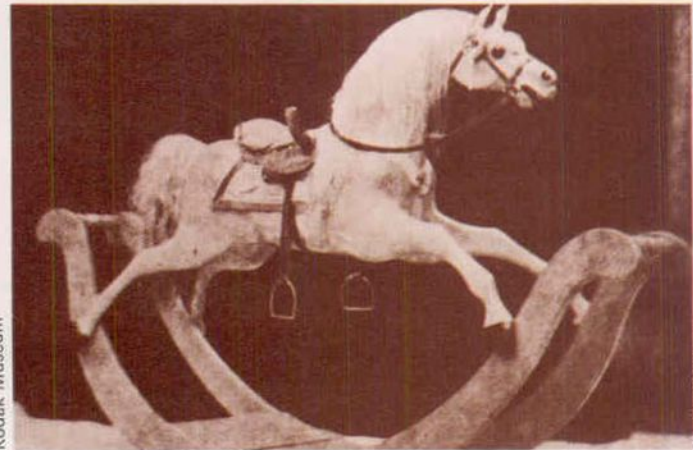
After another six weeks came the announcement of Talbot's discovery of silver bromide as a light-sensitive material—the active agent of today's



Kodak Museum



Mansell Collection



Kodak Museum

Haystack Edge fading here shows the limitations of Talbot's original fixing agent

Rocking horse One of a fine series of still-lives taken at Lacock

Daguerre's revelations, especially as it had become apparent that they differed greatly from his own.

In September 1840, Fox Talbot made his next important discovery. He had been investigating ways of improving the very limited sensitivity of the process using iodide paper. After many months of experimentation he tried soaking the paper in gallionitrate of silver, made by using gallic acid. When exposed dry in the camera no image appeared. But on re-soaking in gallionitrate of silver, Talbot found that the image was 'brought out'—or was we now say developed.

Talbot's early papers simply *printed out*—that is, went dark under the influence of light. His latest discovery made use of the normally invisible latent image, which can be obtained after a short exposure, but which must be amplified or developed before it can be seen. 'This immediately changed my whole system of work in photography,' he was to report, forty years later. 'The acceleration obtained was so great . . . that whereas it formerly took me an hour to take a pretty large camera view of a building, the same now only took about half a minute . . . Portraits were now easily taken in moderate daylight.'

Wiser now, in view of the competition springing up from unexpected quarters, Talbot patented this latest process under

the name of calotype, from the Greek 'calos' meaning beautiful. On account of the short exposures he could achieve, he made his cameras light-proof and provided the lenses with focusing screws. Moving out into the commercial world, he started the world's first developing and printing shop in Reading and then in London, financing his former servant, Nicolaas Henneman, in the project.

He had finally taken a commercial approach and made plans to publish *The Pencil of Nature*, a book of his own photographs. He was also forced to embark on a succession of legal battles over his patent rights. But Fox Talbot was essentially a thinker and an artist. He continued taking photographs (as they had eventually come to be called) and to publish and exhibit them. Over the next few years, while continuing his research into his other subjects, he made photographic tours throughout Scotland, England, Wales and Western Europe.

Fox Talbot died on 17 September 1877. Scholars of various different studies will long remember him for a variety of reasons and for a host of published papers on many subjects. But the world will remember him mainly as the inventor of the principle of modern photography, and as a great photographer in his own right.



bromide paper—and he had already made his first purchase of gallic acid. This material was to further revolutionize the photographic process.

While Daguerre was publishing the details of his process in August 1839, Talbot was attending the opening of an exhibition of his photogenic drawings at the British Association in Birmingham. Although disputes over patent rights of the photogenic process were beginning, Talbot felt sure enough of himself to take a detached and scientific view of

Colour temperature

Colour film produces the best results only when carefully matched to the light source in use. The colour temperature system enables photographers to specify accurately the colour balance of each film, and the colour of any light source

The most noticeable difference between the light from the sun, and the light from a 40 watt light bulb is that of quantity—the sunlight is obviously much brighter. There is, however, another difference which is of great importance to almost all photographers: light from the sun is of quite a different colour from that of the light bulb.

This difference in colour passes unnoticed most of the time, because the human eye is very accommodating. But if you see someone sitting by a window with their face lit by daylight on one side, and by a light bulb on the other, it is easy to see the difference. The daylight is much bluer than the light from indoors, which is tinged with yellow or orange.

Although our eyes can overlook minor colour shifts like this, colour film cannot. It is manufactured to very rigid specifications as to the colour of light under which it should be used. Most colour transparency film is balanced so that it will give correct results under noon daylight—that is, on a sunny day with blue sky. If photographs



Friedel/Rapho



Francois Roiseaux

Mixed light The firelight is too yellow for daylight film and the people's faces have a yellow colour cast

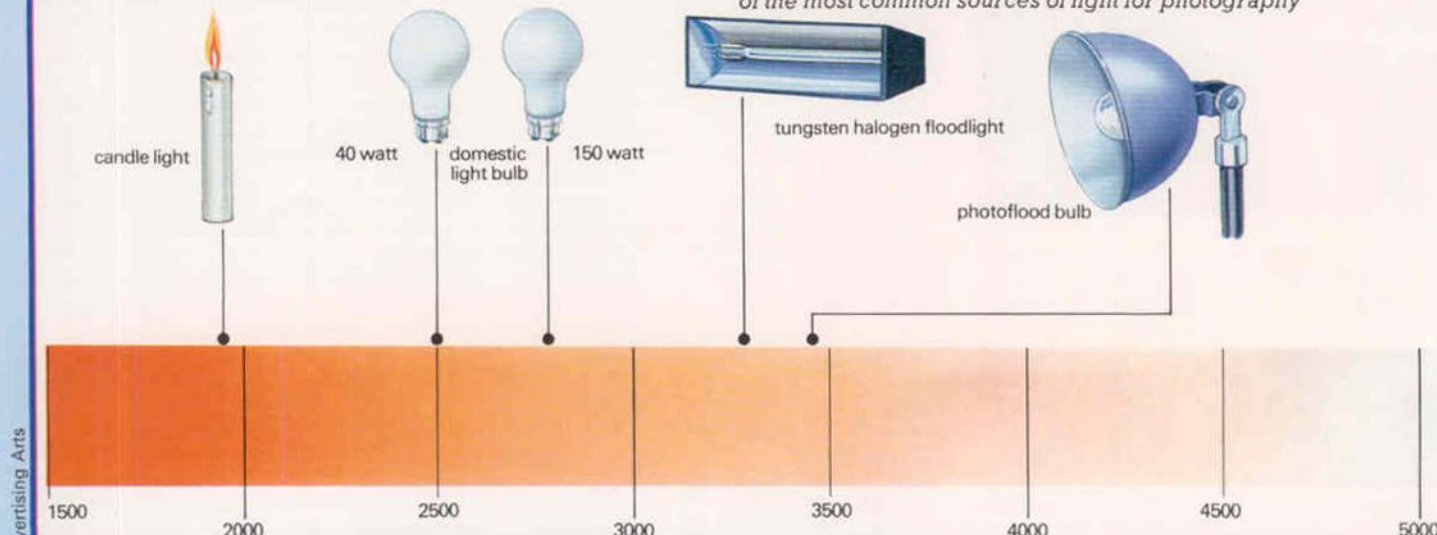
are to be taken in light which is not the same colour as daylight, then a filter must be used, either over the source of light, or over the camera lens. If this precaution is not taken, the pictures that result will have an overall colour cast—they will be tinged throughout with a particular colour. If you have ever taken colour pictures indoors by available light, you will be familiar with this problem, because the pictures will all have a yellow or orange colour cast.

In order to be able to correct for the colour cast a guidance system known as *colour temperature* has been developed (see box). Every film is balanced to reproduce colours accurately in certain lighting conditions. The colour temperature system allows the photographer to

Blue landscape In overcast weather, pictures will be too blue in colour unless correct filtration is used

Colour and kelvins

Candles and sunlight This chart shows, in kelvins, the colour of the most common sources of light for photography



correct the colour cast produced by any lighting system.

Ordinary 'daylight type' colour transparency film is balanced for light with a colour temperature of around 6500K, and if it is to be used indoors under ordinary light bulbs, a blue filter must be used over the lens of the camera. Conversely, if the subject of the pictures is lit only by light from a blue sky—in the shade under a tree, for example—a yellow filter would have to be used.

Which filter?

The colour temperature system seems complicated at first glance, because there are so many possible colours of light. Fortunately, though, the number of different light sources that are used for photography is small, and manufacturers produce glass and gelatine filters which compensate for most types of lighting.

To take a practical example on an overcast day, the colour of light from the sky lies between 6500K and 7500K, and unless corrected, will produce a blue cast on colour transparency film. This can be compensated for by using a series 81 filter—an 81A, 81B or 81C. The 81A is the palest of the three, and is used in slightly overcast weather, whereas the deepest, the 81C, would be used only on a very dull day. The 81B is the best compromise, and can be used for correction on most overcast days.

Light from the sun is much

Evening light Around dawn and dusk the colour temperature drops, and sunlight looks much redder in colour

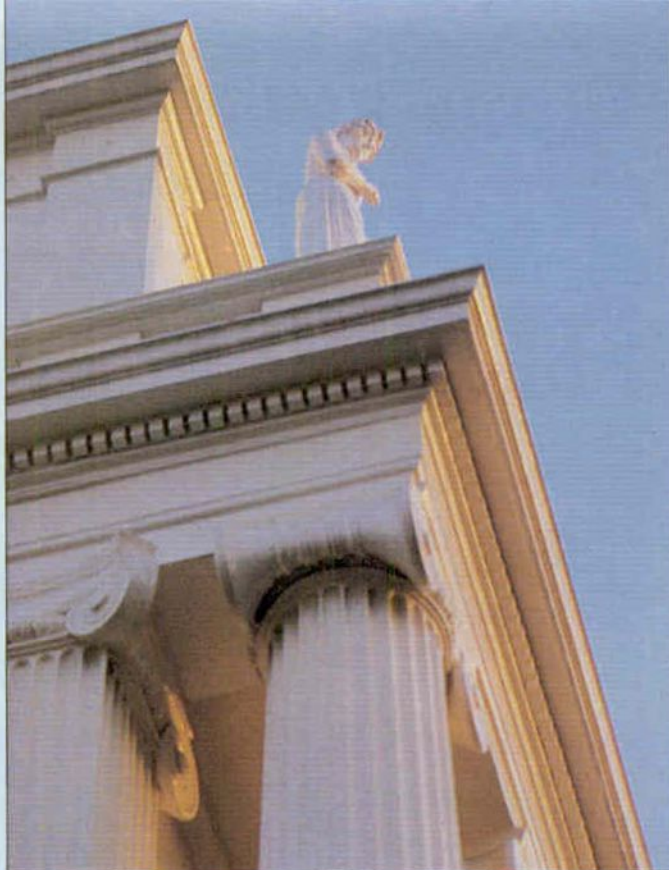
redder in colour in the morning and evening, and here the correction that is needed lies towards the blue end of the spectrum. An 82A filter produces the correct colour balance within two hours of dawn and dusk.

Tungsten balanced film

Since it is sometimes necessary to take pictures in tungsten lighting in the studio, a few film manufacturers make a slide film that is balanced for use in this light. This is called 'type B' film, or just 'tungsten film'. Most professional lighting gives off a light which has a colour temperature of 3200K, so this is the colour temperature for which tungsten film is balanced.

If you have daylight film in your camera, and you want to take a few pictures under tungsten light, there is a deep blue filter available which can compensate for this—an 80B—but the results may not be perfect. This solution should only really be used as a stop gap measure.

Colour negative film users have fewer problems than photographers who take colour slides, because much of the colour cast which results from incorrect matching of light and film can be compensated for in printing.



Paul Webb

Light sources and colour

Photographers use a system called 'colour temperature' to specify the colour of any particular source of light. This system is based on the idea that hot objects glow and give off a particular colour of light at a particular temperature. A hot iron bar, for example, will glow red at fairly low temperatures, and as it is heated further will change colour to orange, through yellow, to white.

By specifying the temperature at which the heated object—actually a theoretical object

called a 'perfect black bodied radiator'—gives off light of a certain colour, it is possible to refer to the colour of any light source.

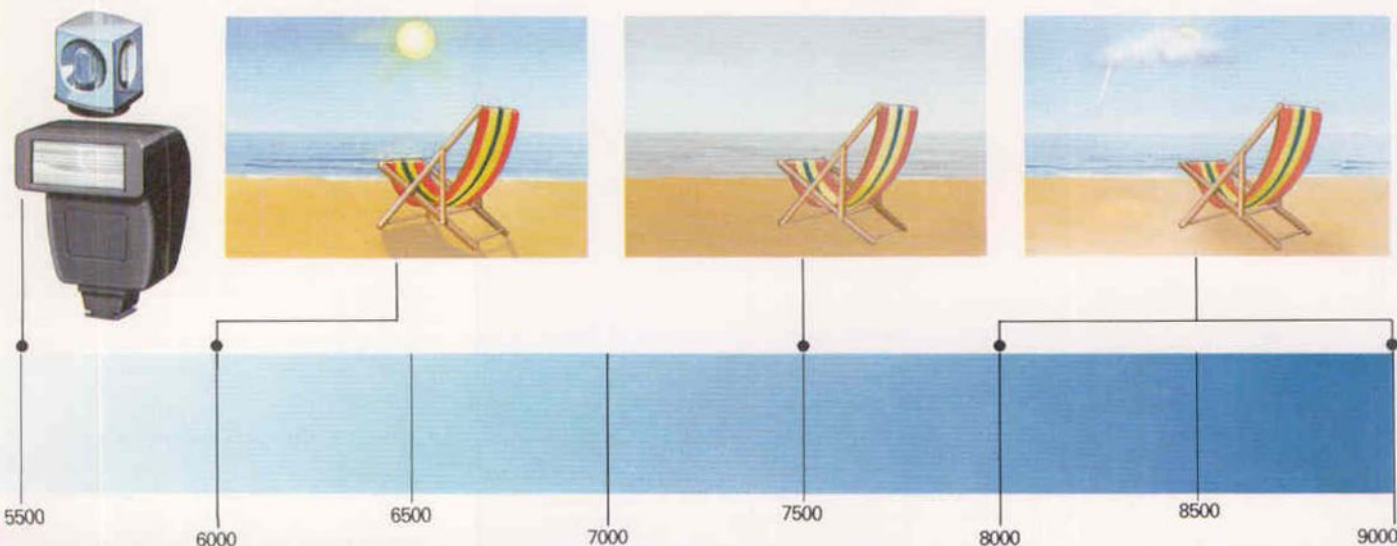
Since this system was devised for scientific use, colour temperature is measured in the units most commonly used in science, which are called kelvins or K. These are the same heat intervals as degrees centigrade, but start at absolute zero—minus 273 degrees centigrade. Consequently, water boils at 373K and freezes at 273K.

electronic flash and blue flashbulbs

sunny day, blue sky

overcast sky

clear blue sky, no sun

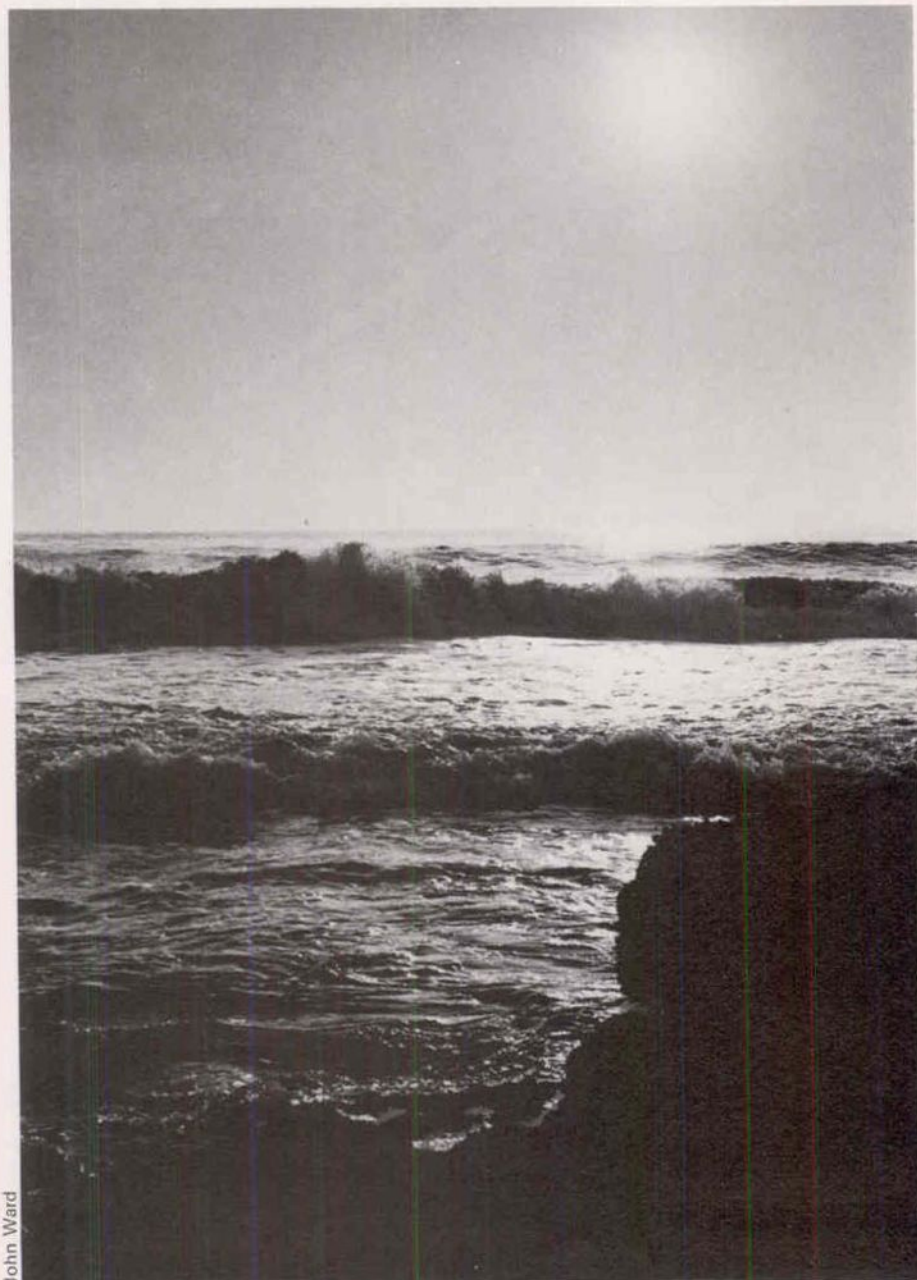




Darkroom

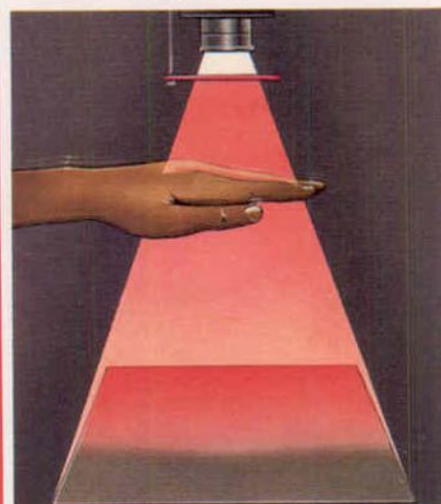
Print exposure control

The technique of 'dodging'—giving selected parts of an image greater or lesser exposure during printing—enables you to print even 'difficult' negs



John Ward

Shading a print



Gauge the effect Try out the effects of using your hands, or shading tool, under the red swing filter of the enlarger before dodging the exposed print

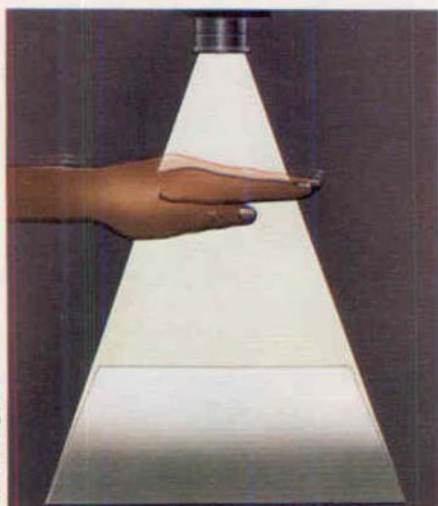
There are two basic ways of controlling the appearance of a print. By adjusting print exposure times you can control the lightness and darkness of the image, and by choosing the right grade of paper you have wide control over the contrast of the image. Between the two you should be able to get prints of acceptable quality from a great many of your negatives.

However, you do come across certain types of photograph—landscapes and portraits in particular—where no amount of juggling about with different paper grades and exposure times seems to yield a successful print. Normally, one part of the image has to be sacrificed in order to salvage detail in the more important part. In a landscape, for example, you may often have to forego detail in the sky area in order to obtain a realistic land area.

A close look at the negative may well show detail that does not print, which is clear evidence that print material cannot handle a very large range of negative tones. But without this additional detail, a landscape tends to look unrealistically bare and unacceptably stark.

You will find there are many other picture situations where a 'straight' print is less than satisfactory, but the basic problem remains the same. And the best way to deal with it is to give each part of the image its own correct exposure, either by holding back part of the image during an overall exposure, or by giving additional exposure to a small area afterwards.

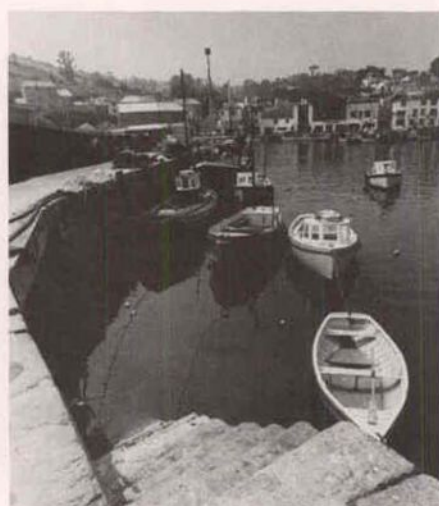
Into the light The type of shot that nearly always results in a negative which is difficult to print. Here, in a normal grade print, the sky and reflections require twice the exposure given to the sea portion of the image



Shading during exposure When you have some experience of dodging, you can shade the lighter part of the image once the time for this is reached



A 'straight' print If you do not dodge, the exposure should be based on the most important part of the negative—the result here is a washed-out sky



A shaded print The sky area was given its full exposure, but the rest of the image was shaded when it had received enough exposure

Holding back exposure

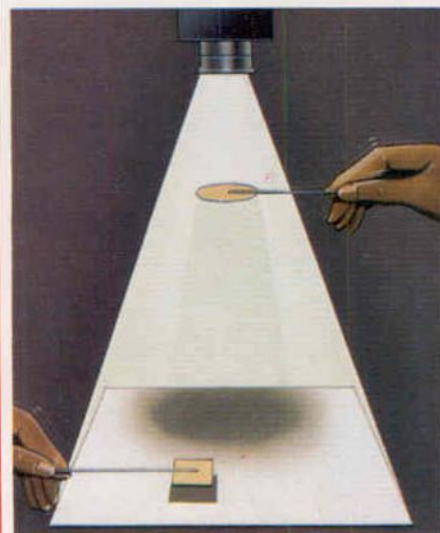
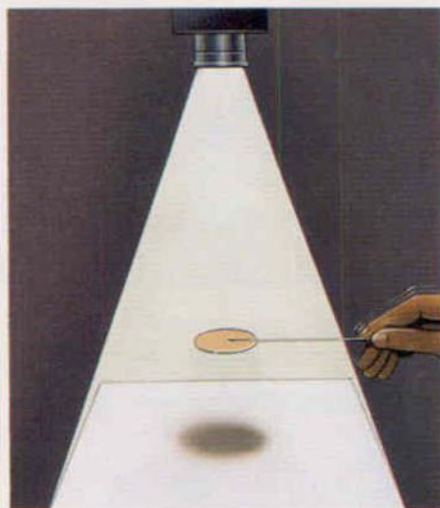
The technique of holding back or adding exposure of part of the image which prints too light or dark in an otherwise normal print is called *dodging*. You do this by shading the print during printing. In many cases this job is easily done using nothing more than your fingers or hands—but for more intricate and isolated shapes, and for greater control, it is an easy matter to prepare *dodging tools* from pieces of opaque card taped to stiff wire. You can build up a collection of the more commonly used shapes such as crescents, circles, squares and rectangles. Others can be cut to shape as required.

Elaborate dodging tool sets can also be bought but these are perhaps less suitable for individual requirements than easily adaptable home-made tools.

Before you consider using the technique, bear in mind several important points. In shading, you are simply interrupting the projected beam, causing a shadow to fall over the lighter area of the negative image which you wish to receive less than the overall exposure. Anything in the light path—such as the wire of a dodging tool—can also cause a shadow, which prints light.

For an experiment, turn on your enlarger to observe the effects on the shadow of moving your hands (or a piece of card) up and down in the path of the light beam. You can see that the outline of the shadow becomes more clearly defined the closer your hands get to the baseboard and the easier it becomes to form a clean, clear shape. The higher you raise your hands, the less clear the shadow border and area become. By twisting and angling your hands, all sorts of different shapes are possible. Again, try out the effects under the enlarger beam.

Using shading tools



Dodging tools You can make a dodging tool from stout wire and opaque card cut to the required shape. Plan to use the tool a little way above the print

Shadow and movement The tool shadow can be softened by raising the height of the tool above the print, or by movement of the tool during use

Against-the-light portrait In this type of situation a negative often requires dodging. A shading tool was used here to give less exposure to the face region

For most purposes, the best and most convenient dodging height from the paper is about a third of the distance between this and the lens. The shadow edges are reasonably blurred (to enable adjoining areas to 'fuse' together as inconspicuously as possible), yet the hand or dodging tool is easy to shape.

But to avoid the formation of a hard, clearly defined image between the normally exposed and dodged areas of the print, you must always move your hands or the dodging tool all the time you are dodging. This should be enough to prevent a shadow of the dodging tool wire from forming, and also helps to give a blurred edge to the shadow of the dodging tool itself.

Adjusting the combination of height and movement gives you considerable

control over the effects of the dodging shadow and its ability to cut down exposure in a particular area. But although it may be possible for you to gauge the effects by attempting a dry run (under the red swing filter) before making the print, you can only get the essential practical experience by trial and error.

Increasing exposure locally

Sometimes you may want to give an additional exposure to a small, particularly dense area of the negative which prints too light in an otherwise normal print. This is called *burning-in*. It is just the opposite of shading, and is a technique useful for subjects which include bright light areas within the picture view—such as windows in

indoor shots, and faces in the foreground of a flash photograph.

Once again, you can usually use your hands for burning-in, but shapes are easily cut from opaque card and the significant advantage of this is that it leaves a hand free to both start and end the exposure—important if you use a switch or swing filter in place of a timer switch.

The technique is readily interchangeable with shading in many instances, and because of the way the exposure is given it is worth looking at the difference between the two techniques. You may find it easier to burn-in one area where you would, on first impulse, have tried to shade out the rest of the area, and vice versa. The terminology and techniques each describe particular localized action in relation to one main exposure.

In shading, you are holding back the exposure in a local area for part of the main exposure time; in burning-in you are effectively shading the main part of the print for a period beyond the correct main exposure.

Manipulating exposures

If you are dealing with an unfamiliar negative, and guesswork or test strips indicate that a single exposure is inadequate for the print, make additional test strips to determine any necessary time variation. Usually, much of this information is obtainable from the original test print, such as shown on page 164. In this example the best 'land' exposure is 15 seconds while the best 'sky' exposure is 20 seconds—so for a basic 'straight' print one can choose a time at each extreme, or somewhere in between.

For the best print, however, each should receive its own 'ideal' exposure. A little extra to the sky area adds subtle detail to the highlights in the clouds, while holding back the exposure of the lighter (land) parts of the negative preserves most of the shadow detail. In effect, you either have to shade the land area, or burn-in the sky area. The resulting print (p167) is worth the slight additional effort required, and there are no telltale signs of the job having been done. You should always try to conceal 'work' done on a print.

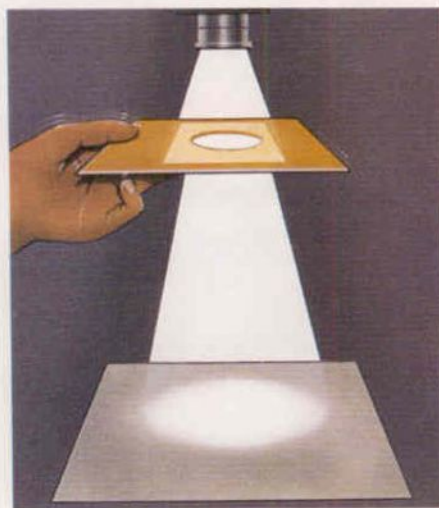
When you have established the two times for your negative (there can be more if necessary), work out how you are going to give the exposures. When you have had some practical experience the most convenient way is to give one long exposure, part of the way through which you shade the lighter part of the negative image.

But to start with, you may find it easier to give two separate exposures, the first based on the requirements of the lightest part of the negative image, the second on the darkest. You must be careful not to jog or otherwise disturb the negative or print between the two exposures or you will get a double image on the print.

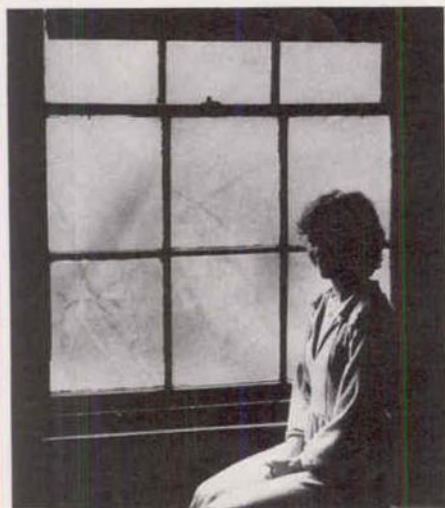
Burning-in



Burning in with your hands You can shade the normally exposed portion of the print while adding exposure to a central area by using your hands



Card masks More precise shapes can be burned-in using cards which have holes cut in them. Height and movement affect the size of the projected hole



Girl by window A straight print from this negative gave a completely washed out window. Some detail can be added by burning-in the window area only



Musician Card masks can be placed on the print during exposure to produce a hard-edged vignette, or raised slightly above the print for a softer edge

On-print masking

With clearly defined and regularly shaped areas where shading or burning-in is required, it is often better (and much more convenient) to make use of flat card masks cut precisely to shape and placed on the print itself during the dodging part of the exposure.

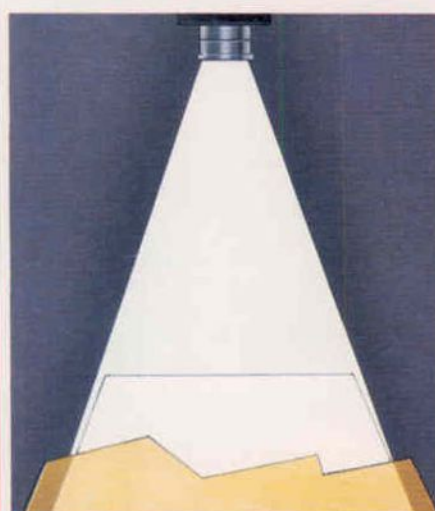
A typical example is a shot of a building in which sky detail or tone is required. The sky is burned in while the building itself is shaded.

You can produce the mask by projecting the image on a sheet of white (but opaque) card cut to match the size of printing paper you are using. Trace off the border line with the card held correctly in position on the masking frame, and then cut it accurately to shape. The card outline must exactly coincide with projected detail during enlarging or the border line will show in the print.

Having done this, expose the print in the usual way for as long as necessary for the building (the lighter part of the negative). Then very carefully open up the lens to its maximum aperture to improve viewing brightness. Again, you must be careful not to disturb the negative or print in the process. Swing the red filter into the beam and switch on the enlarger again. Now carefully rest the card mask over the print and register its edge with the projected image. The mask must lie in close contact with the print. You can use a sheet of clean glass (or a special copying easel) to keep the mask and print sandwich flat during exposure.

Stop the lens down and swing the filter clear to expose the sky detail for the required time. If necessary, you can use your hands to shade (or, indeed, burn-in) a further area of detail in the

Masks on the print



Cut and align First cut the mask, perhaps using an old print as a template. After the main exposure, use the red swing filter to position the mask

Second exposure Switch off the enlarger, carefully swing the red filter aside, and then expose the dark area of the negative for the extra period

With and without a sky Even though there is no actual detail in the sky, burning-in tone here is much more effective and pleasing

Advertising Arts

John Ward



Jon Bouchier

sky portion of the negative. If the technique is successful, the sharp edge of the card mask should not be noticeable against the clearly defined detail of the building itself.

Vignettes

You can use a variation of the burning-in techniques to produce a simple vignette—a portrait (usually) whose normally oval image gradually shades off to a uniform white background.

Cut an aperture of the required shape in a piece of card and hold this between the print and lens for the whole of the print exposure. Keep the mask moving around, remembering that the more you do so, the less clear becomes detail at the edge of the image.

Vignettes are particularly successful when combined with certain print treatments such as toning, which tends to give an 'aged' look to the photograph, in keeping with a technique which was once very popular.

Meaningful test prints When you make a test print or strip, try and include areas which may need different exposures. A single test helps in easy comparisons



Improve your technique

Flash off the camera

Separating the flash from the camera—using a flashbar, hand-held unit or separate stand—allows you a wide range of control over your lighting and gives better results than using the flash on the camera

Keeping the flashgun attached to the camera is a very straightforward way of lighting a subject. The light is automatically aimed at the same subject as the camera and there are no trailing cables to impede movement. It is a flexible system and simple to operate, but the results are rather limited for effects. If you want a broader, more subtle range of lighting effects with flash, you will have to detach the gun from the camera.

Flashbars

The simplest and most convenient way of moving the flashgun away from the camera, if only for a short distance, is to mount it on a flashbar. These take various forms but basically consist of a bracket which fastens the flashgun to

the camera. The camera is attached to the bracket by the tripod bush in the base plate, while the gun is attached by the foot on its base or by a similar bush. A short lead connects the two and synchronizes them.

If there is some distance between the gun and the camera, the light will strike the subject at an angle that is slightly different from the lens to subject line. This means that both highlight and shadow areas will be apparent to the lens. If the gun is still relatively close to the lens, the shadows will not overwhelm the highlights, but some shadowing or modelling will be introduced. The flexibility and mobility of a self-contained hand-held unit are very useful advantages for parties or similar situations where you wish to move around freely.

You have fewer problems with awkward or ugly shadows, and you avoid trailing synchronization leads that can easily be damaged or disconnected.

Mounting the flashgun on a flashbar instead of on the camera itself makes little difference to lighting the subject except at quite close viewpoints. If the subject is more than about a metre away, the difference in lighting is negligible.

Hand-held flash

An even broader range of lighting effects can be achieved by completely separating the camera and the flashgun. With a

Miss World 1970 Many photographers here are using flash bars or separate hand-held units to give better lighting quality





Girl with shadows Lit from above—eye sockets blacken, the nose casts a triangular blob, and the neck disappears



Kim Sayer

Girl with modelling Lit from side with hand-held flash, features are defined by soft shadows to one side

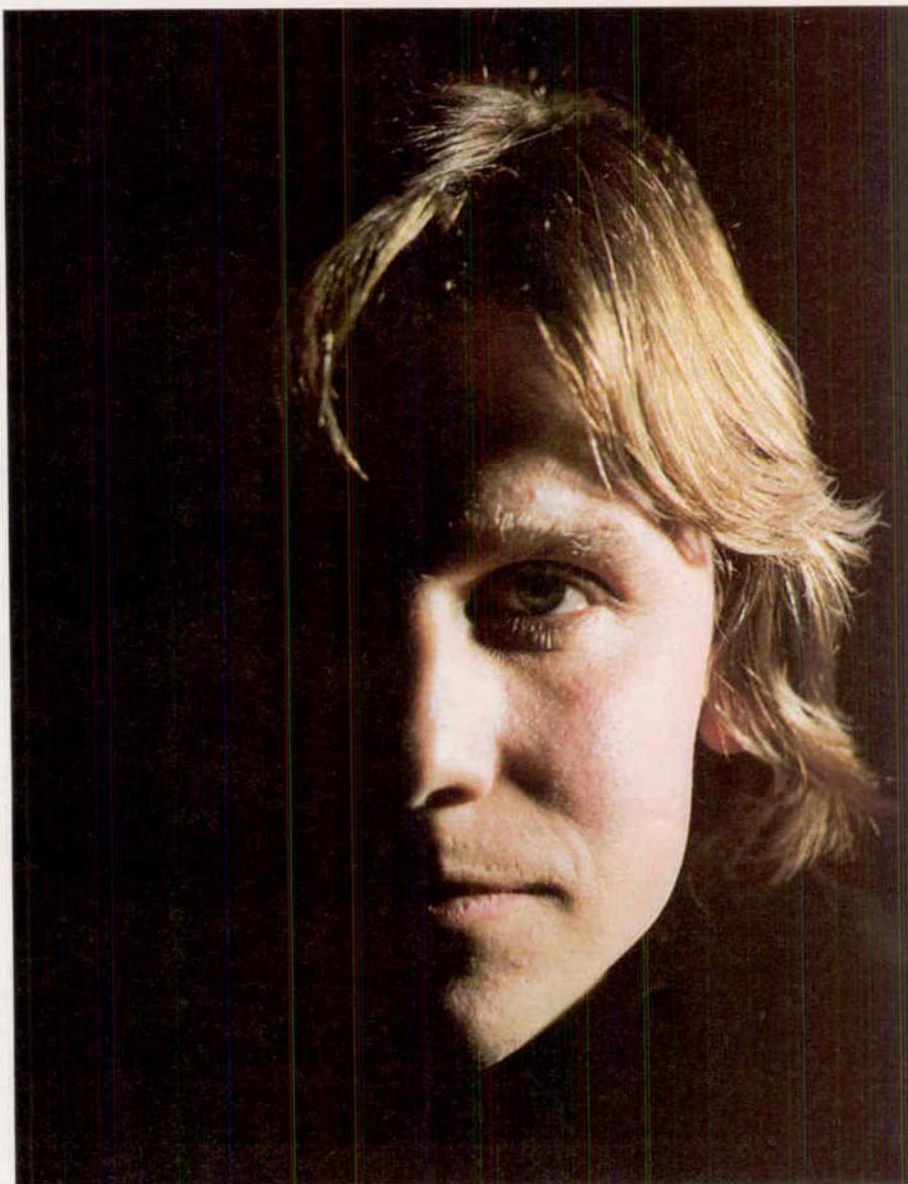
small gun and a lightweight camera, the juggling of the two is not much of a problem once you develop your technique. The most important thing is to keep the camera straight and the gun pointing in the right direction.

As you cannot know the exact effect of holding the gun in any particular position, it is a good idea to experiment a little at first. As a guide, the higher you hold the gun, the more the shadows will resemble those created by sunlight or the ceiling lights in the room. The further to the left or right you hold the gun, the more shadow will be formed on the opposite side of the subject.

The distance from the gun to the subject will also affect the shadows produced. Subject to the length of your arm, the maximum height of the gun will be approximately 2 to 2.5 m. If the subject is only 2 m away the lighting angle can be varied from camera height—with the light parallel to the lens to subject line—to an acute angle, with the light held at arm's length. At a distance of 10 m, the difference in the lighting angle between these two points is considerably less.

This technique is ideal for an informal portrait. The location of shadows on the face is the key to a good picture. If in doubt and you want to be certain of a usable shot, try holding the gun a little above your head and to one side. If you avoid getting so close to your subject that you have an acute lighting angle, you will create some shadows that give form to the face without making them too obvious. With both a flashbar and a hand-held camera, the auto exposure of a flashgun will still operate.

Side lit With the flash to one side and black velvet draped to 'lose' his neck, the subject is dramatized—a good technique to show character



Kim Sayer



Backlit flowers With the flash behind and below the flowers, petals become translucent and seem to glow against the black background

A separate stand

Fixing either the camera or the flash, or both, to a tripod or stand overcomes the handling problems sometimes encountered when trying to hand-hold your equipment. If you have a long synchronization lead, you can get a range of lighting positions impossible with flashbars or hand-held flash. The disadvantage is that stands are static and you often have a long trailing lead that can become a nuisance.

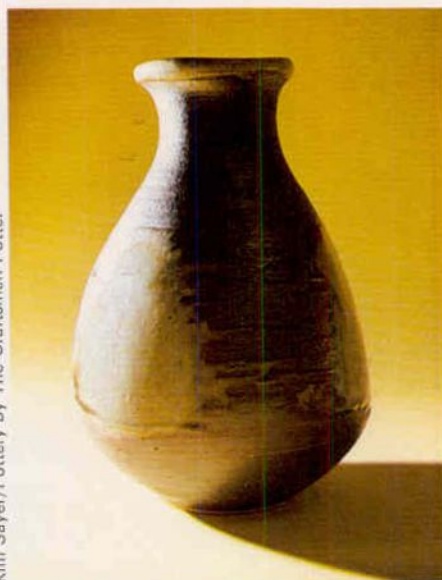
Removing the flashgun from the camera confuses its automatic function. With the flash and camera at different distances from the subject, the automatic sensor is misled. Some manufacturers solve the problem by supplying a removable sensor which can be attached to the camera's accessory base and connected by cable to the flash unit. This way the sensor still measures the reflected light from the camera position regardless of the position of the flash and fires it for the correct time.

Use of stands is best restricted to stationary or formal situations. A stand is ideal if you want to take still life subject such as vases of flowers or other table-top subjects. It is also suitable for formal portraits or shots where a person is limited to a particular spot by what they are doing, such as making some piece of pottery or carrying out some other work.

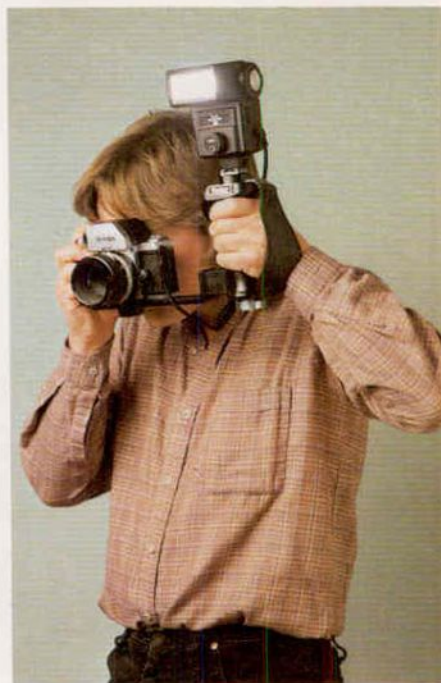
As well as allowing you to vary the flash angle, a separate stand will also let you move the flash unit closer to the subject, or to one side of it. This gives greater flexibility and offers greater creative opportunities. But at the same time you may give yourself problems of exposure.

If the gun is only slightly closer to the subject, you can still use its auto exposure system. But for more extreme variations, it is best to switch it to manual use, and work out the camera aperture using the table on the unit. In this case, the distance involved is that from the flash to the subject, rather than camera to subject.

Lighting for shape Shadows can accentuate a shape lit from the side or back. Forward-falling shadows can be very effective too.



Kim Sayer/Pottery by The Craftsmen Potter



Flash guide numbers are computed from the basis of flash on the camera giving front lighting. When the flashgun is removed from the camera, the guide number has to be reduced. For example, under average conditions the guide number for 45° lighting is the guide number for flash on the camera multiplied by 0.7; thus, a guide number of 33 becomes 23.

The alternative to this is to leave the flash on automatic, but to calculate the alteration in camera aperture that will be needed. If you would normally use the camera at $f/8$, but the flashgun is now at halfway between you and the subject, you will need to reduce the aperture by one stop to $f/11$.

You have more choice in the lighting angle with a stand than when the gun is hand-held. You also have the freedom to move round a static subject checking on angles and considering the effects of placing your equipment in different arrangements.

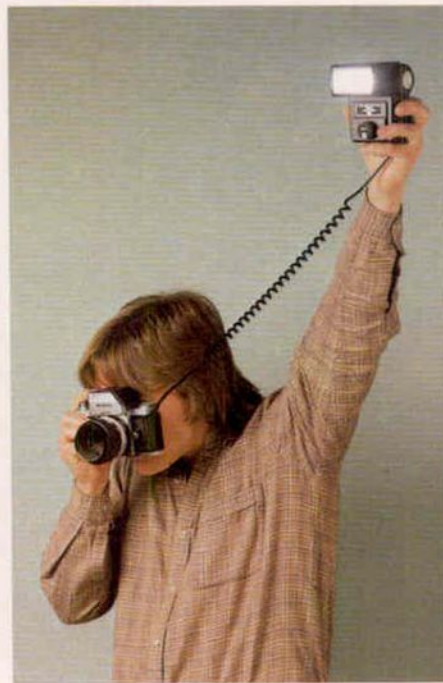
The basic principle for positioning the gun is simple: the further it is from the lens to subject line, the greater the shadow area will be. When taking a portrait, be aware of the shadow cast by the nose. It can form a dark triangular blotch on the face if the gun is placed in the wrong position.

Lighting effects

The amount of shadow should relate to the character and appearance of the subject. In a portrait, smooth, soft skin should be matched by light, inconspicuous shadows, while more rugged

Flashbar A bracket fastens the flashgun to the camera. This distancing introduces some modelling

Hand-held flash For stronger modelling, especially of a close subject, hold the flash at arm's length



Kim Sayer

features can be depicted more dramatically. This simple approach can be varied once you have gained experience.

Still life subjects will often allow you great freedom over lighting effects, as long as there are not too many surface projections creating ugly shadows. The first thing to consider is whether you wish to emphasize the colour, shape or texture of the object. If you decide on colour, then you will probably find that placing the gun near the camera will provide the virtually shadowless lighting that gives colour prominence. Emphasizing the shape of the object often means separating it from the background by means of lighting. With a single flash gun this can be achieved either by shading the background by means of a board placed between it and the gun, or by lighting the object from behind. Back lighting is best confined to translucent objects such as glass. The texture of a surface is usually brought out by using side lighting.

All these effects are limited by having only one light to work with. Using the flash for more subtle effects is described in a subsequent article.

Oriental woman *The flash was placed to one side and slightly above to give a pleasing result*

Soft shadows *A diffuser over the flash unit softens the shadows and gives a more glamorous picture*

Stephanie Colasanti FILIP



Kim Sayer

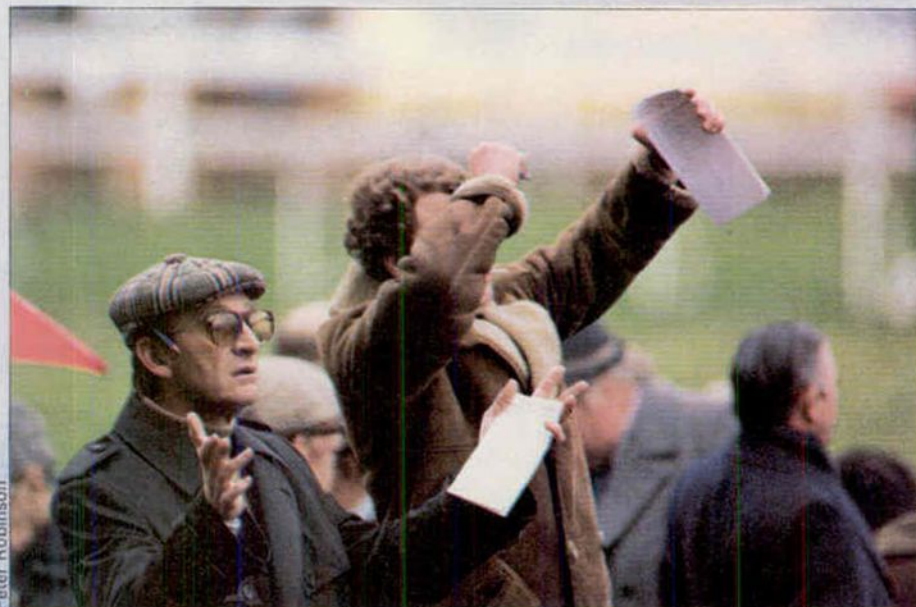
With its graceful thoroughbreds, dramatic action and crowds of punters, a steeplechasing event is full of photographic possibilities. Peter Robinson went off for a day at the races to discover the problems

At the

At most sporting events, the biggest problem for the photographer tends to be finding a suitable place to shoot from, and this is particularly true of horse racing. Racing can be very dangerous and the authorities naturally discourage photographers from wandering around the course at will. Peter was able to get reasonably good views of the jumps at this event, but most photographers are not so lucky.

'If you are going to shoot at one of the smaller courses, it is always worth writing to the secretary of the course well in advance to let him know precisely what you have in mind and convince him that you have a responsible attitude. Most professionals have already been through this procedure.'

'If you are very lucky, you may be allowed to set up your camera beneath a



On parade With curved fences and the horse and girl alone near the centre of the frame, the parade ring was shot on a 16 mm lens without undue distortion

Bookies A long lens allowed Peter to get a candid shot of these course characters

Before the race A Colourful shot of the jockeys on their way to the paddock



Peter Robinson

races

jump before the races begin to be operated by remote control later for a dramatic shot of the horses taking off. Either way, you should get to the course early to look for the best viewpoints.

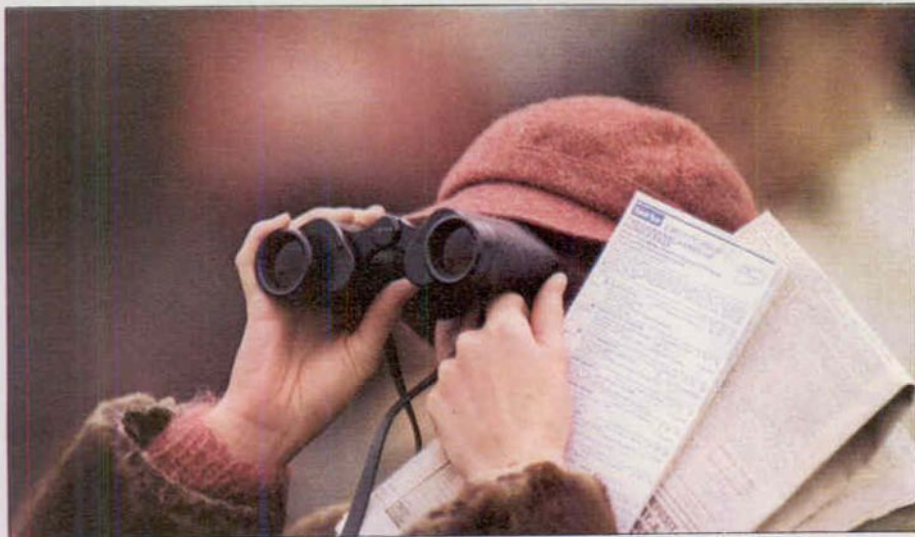
The chances are, though, that you will not get very close to the action and, if you can get one, a long telephoto—400 or 500 mm—would be invaluable.'

This assignment was done in winter when the weather was, to say the least, unpredictable. With the light often poor, shooting rapid movement on telephotos would normally suggest a fast film, but Peter decided to use a slow film despite its disadvantages.

'One of the beauties of horse racing is the rich tones and textures of the horses' skins. I felt that this would only come across strongly on a relatively slow, fine grain film.'

When the light was poor, Peter explored all the possibilities for static shots in the paddock, in the parade ring and among the crowd, but as soon as the sun came out he rushed over to the course for the exciting action shots.

Unfortunately, moving around can tempt a photographer into shooting hurriedly; a few pictures suffer from poor framing and background distractions but successes more than compensate.



Woman watching

With form card, warm hat and binoculars, this candid shows what racing is all about

Into the sun Peter took advantage of the changeable weather to get this dramatic picture of the race against overcast skies





The parade ring For this shot, Peter concentrated on the horse, forgetting about the girl leading it; so her face was unfortunately obscured by the horse's head



Horse and girl This is a great improvement—Peter allowed the horse and girl to come closer before shooting and they are both clearly the focus of attention



Over the jump When the sun came out, Peter dashed to the jump for an action picture, but the background car and the horse's position gave an ungainly result



Leaping clear Here the background is far freer from unpleasant distractions and the result is quite pleasing, but is still marred by the white fence before the jump



Home run When the horses are coming towards you, wait for groups like this to come closer or break up so that one horse does not hide another

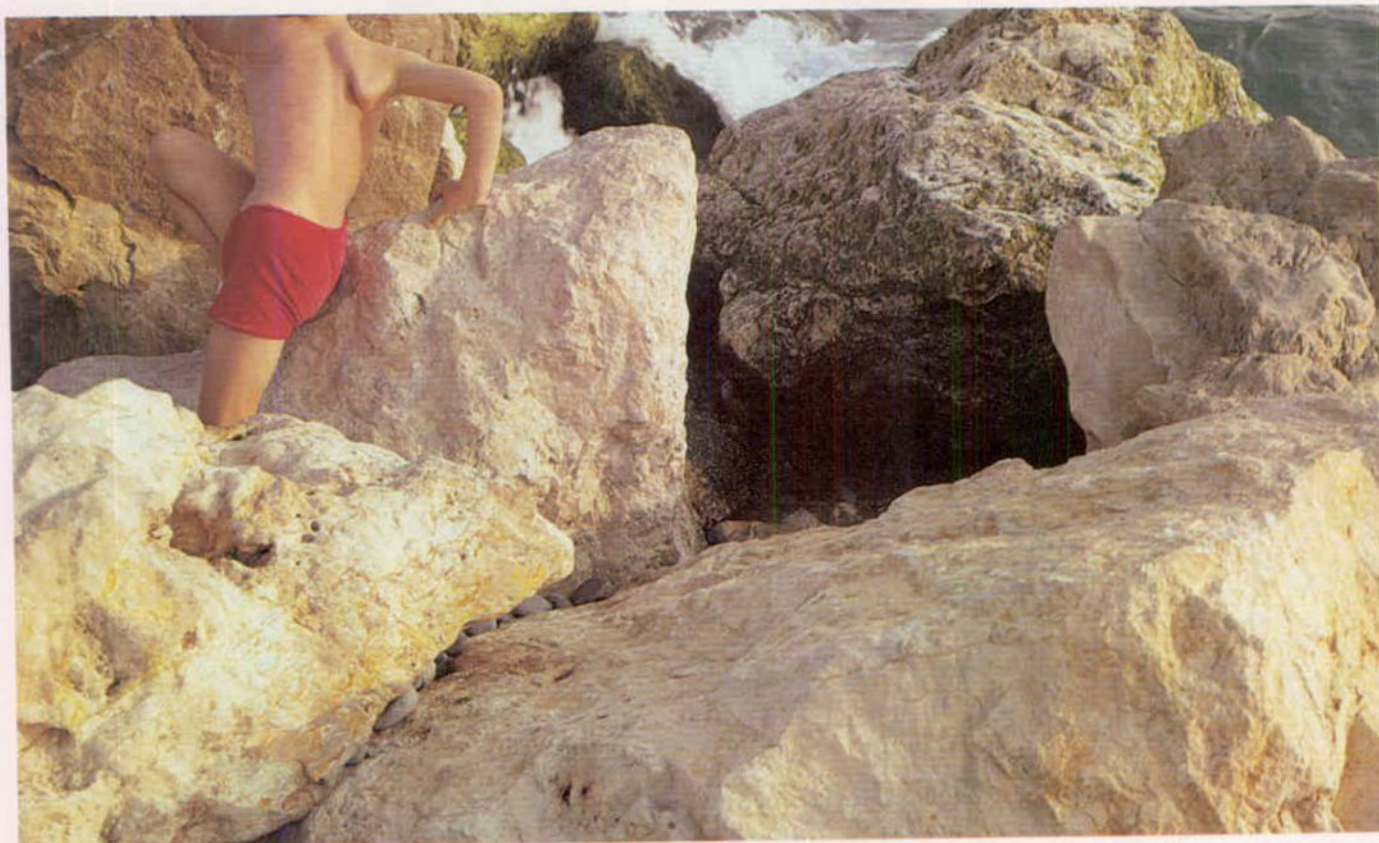


Neck and neck The timing of this shot gave far better grouping and also showed some of the horse's flanks for a more interesting shot



A splash of colour

A small area of bright colour can bring a spark of life to a dull scene or create dramatic abstract effects



Neill Menneer

Our attention is always drawn by bright colours, and with colour film in the camera it is hard to resist the temptation to fill the frame with brilliant reds, yellows and blues. But colour needs careful handling and a subtle approach often produces the best results. A single splash of colour in a generally monotone shot can be far more dramatic than a riot of competing hues.

In the early days of colour photography, the available films were slow and had poor rendering. For effective results, brilliant colours and strong light were almost essential but modern films, which can record even the minutest tone variations while retaining full colour saturation, will perform well under a tremendous range of conditions. In fact, bright colours and harsh light can be somewhat overpowering and quite often must be handled with care to avoid clashing colours and extremes of contrast.

Seeing colours

One of the problems is that the eye sees more selectively than the camera. The varied and exciting display of natural colour in a flower market may seem to be full of photographic possibilities, but many people who try to record such a

Red shorts *The splash of red provides the focus for an almost abstract shot*

Leaf *A dull shot of bark texture is lifted out of the ordinary by the green leaf*



Neill Menneer

scene are disappointed by the results. The colours clash and upset the balance of the picture and they seem to lose all their original sparkle as each colour competes for dominance. You may not have noticed this when looking at the scene before shooting because of the way the eye behaves in selecting areas of interest one at a time, and instinctively refusing to dwell on discordant elements.

Perhaps the key to successful handling of colour is learning to see as the camera sees so that you can select the colours that contribute to the desired effect and exclude those that do not. Just as important is learning to spot the single, small area of colour that will spark off the view and create a compelling image.

Pure, bright colours are comparatively rare in the natural world and muted browns, greys and greens predominate. In fact many creatures and plants are subtly camouflaged and blend unobtrusively into the landscape. Some life forms, however, need strong colours to stand out boldly and draw attention to themselves, like a bright yellow flower or a brilliant red berry.

Human beings share with many other animals an instinctive awareness of the significance of bright colours and our

attention is almost unavoidably drawn to them. You should remember this when composing your shots.

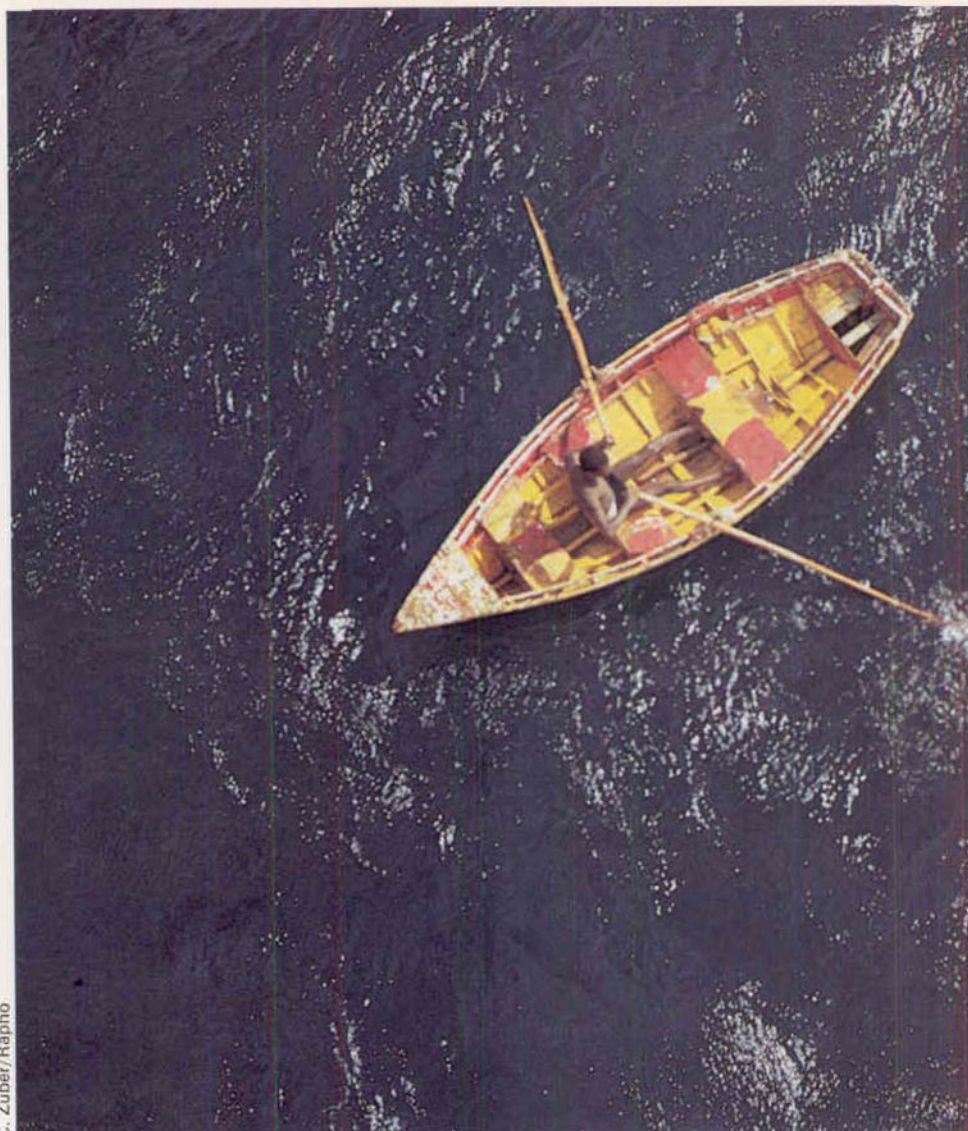
In a mountain landscape full of huge and dramatic but greyish rock formations, for instance, our attention will immediately focus on the tiny figure of a climber in a red anorak. This can be both an advantage and a disadvantage. If the climber is the subject of the photograph, there is no need for tight framing for him to dominate the image. In fact, the picture may actually benefit from keeping him small in the frame, contrasting him with the dramatic surroundings and yet maintaining him as the centre of the viewer's interest.

Centre of interest

Paradoxically, the dominance of a splash of colour, like a climber in an anorak, may be emphasized simply because of its smallness within the frame. This is where the psychological force of the small, brightly coloured area must be treated with caution. If the photographer's intention is to show the desolation and grandeur of nature, it does not matter how small the red climber is in the frame or how magnificent the geological formation—there is still the danger that the viewer of the photograph will immediately concentrate his interest on the single area of colour. Similarly, no matter how interesting the face or how expressive the gesture, a candid shot of a stall holder in a flower market could easily be overwhelmed by the bright colour of the flowers.

In situations like these, therefore, the way to a good shot is to compose the picture carefully so that the distracting colour complements the main object of interest and each has the same visual weight. With the mountain scene, the red climber should be as small as possible and set in the frame in such a way that he is balanced in the scene by his surroundings—perhaps low and to one side.

C. Zuber/Rapho



Letter box Red is always particularly eye-catching. Here it adds a warm and cheerful note to a scene that might otherwise look too cold

Rowing boat A small area of strong colours—the yellow boat—against a field of its complementary colours—the dark blue sea—can be dramatic

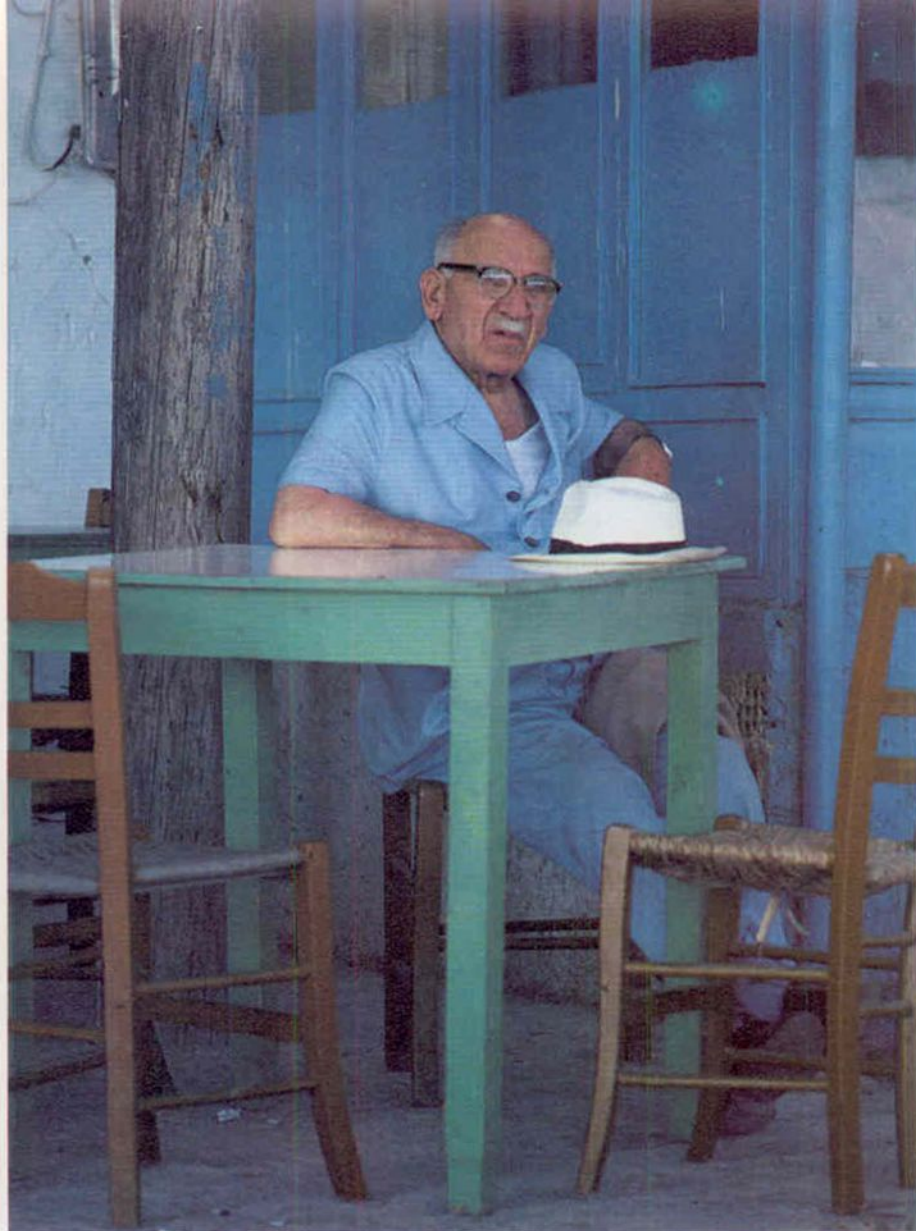


Trevor Wood





Yellow petal An area of bright, almost pure colour separates out from a sombre background so much that the effect is almost surreal or abstract



Neill Menneer

Sitting in the shade Certain colours evoke certain moods. Here the predominance of pale blues and greens creates a calm and tranquil atmosphere

In the case of the stall holder, the camera could close in tightly so that the flowers, although still visible, occupy just a fraction of the frame in relation to the main subject. The result may be even more effective if only flowers of a single colour are included in the frame and there is a single focus of interest.

Colours and emotion

Another point to remember is that different colours have different psychological effects. Individual responses to colours vary a little but it does seem that certain colours tend to create certain emotions and moods. Artists have long been aware of these expressive qualities of colour. Picasso, for example, in his so-called 'Blue Period' used blue to convey melancholy and pessimism in his painting at the time. His subsequent 'Rose Period' used soft pinks to create a more lyrical and romantic mood. Other artists have used forceful reds and yellows to suggest excitement and even

anger or violence in their work.

In general, it does seem that colours have their emotional equivalents. Like painters, photographers can put this to advantage. You may be able to suggest drama and excitement in a picture by including a bold splash of red—a demonstrator's banner or a bullfighter's cape, for example. But you must choose your viewpoint and arrange the composition to ensure that the colour contributes to the impact of the scene.

When shooting in colour it is also important to remember how colours relate to one another. This is particularly true of the small area of strong colour used for compositional effect. Just as music can be 'harmonious' or 'discordant' so can colours—some colours go well together, producing a pleasing effect, and others clash. The usual schematic way of presenting this is the colour wheel, in which the colours of the spectrum are formed into a circle, with those colours next to each other—blue and green, for example—combining harmoniously and those opposite contrasting, such as red and blue. When two opposite or *complementary* colours are found adjacent to each other, they vis-



Sergio Dorantes



City scene *The eye immediately picks out the colour of the line of taxis and the neon sign amid the grey tones of the buildings, even though they are tiny*

ually separate very strongly.

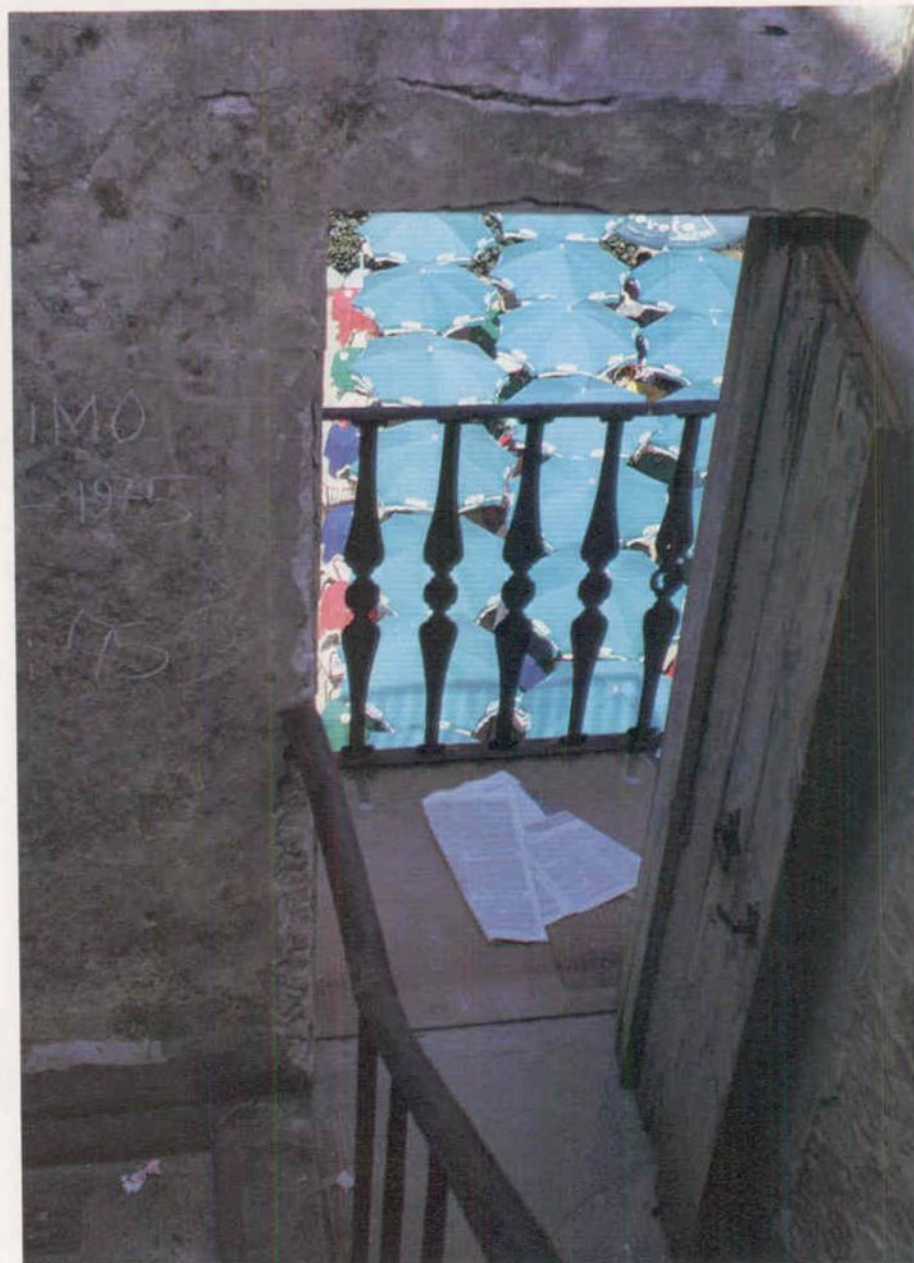
When composing a photograph, it is important to bear these relationships in mind. They can be used either to control and modify the effect of strong colours or, conversely, for dramatic effect. A still life with oranges and lemons, for instance, in a bowl of neutral tone will produce a bright, harmonious photograph—in a magenta (pink) bowl, though, the colours would clash horribly.

But by using just a splash of the contrasting colour, you can create strong and interesting pictures. Red and green clash particularly violently but the effect can be controlled and used to increase the impact of your landscapes. A small area of red blossom, for instance, positively glows with life against a background of green foliage. The contrast between subject and background becomes the main feature of the picture, when used intentionally—quite unlike the results of a confused discord of randomly placed, clashing colours. A splash of green against a bright red background, however, is generally more unsettling, because of the emotional effect of red and perhaps because we are less used to seeing this sort of colour relationship in the world around us.

Enlivening the scene

The splash of colour can make or break a picture. Harmonizing with its surroundings, it provides the focus of a balanced composition. Contrasting with them, it can stand out as an emphatic note in a deliberately dramatic composition. In many instances, however, the problem

Blue doorway *The photographer has cleverly created a splash of colour by framing the blue umbrellas in the grey stonework—unusual but effective*



Girl in yellow By keeping the area of yellow fairly small, it nicely balances the contrasting blue of the door—a larger area would be unsettling

filters are used, even though they appear white to the eye. Similarly, tungsten room lights have a distinctly orange tinge though this can be used to advantage—a single, lit window in a lonely cottage in a dusk landscape, for example, will add warmth to the picture from its reddish hue.

Just how much weight a splash of colour has may depend ultimately on your equipment. It may be possible, for instance, to isolate your coloured highlight within a single tone by close framing with the use of a long focus lens. Film type may also have a marginal effect. Slower colour transparency films, such as Kodachrome and Agfachrome, have greater colour saturation than fast films, such as Ektachrome 200 or 400. Colour negative films such as Kodacolor also offer an additional opportunity at the printing stage. If you do your own printing or know a helpful processing laboratory, it should be possible to increase the intensity of a desired colour by using appropriate filters during the enlargement stage.

It is important to remember that colours may actually appear more vibrant with the reduced contrast of a hazy or overcast day, as long as there is a good level of illumination. A light colour, such as yellow, may stand out more strongly when against a background of a darker tone. In this, as with other aspects of photography, the creative photographer will learn to use techniques and skills, together with an understanding of the response of film to light, to extend his control over the image.

Washing A shot like this, with many competing colours and shapes, does not normally work, but the red of the dress is just strong enough to hold it together



Kate Salway

Composition is, of course, vital. For the splash of colour to enliven the whole scene rather than float imprecisely in the middle of it, it should be carefully placed. Although there are no hard and fast rules, it might fit happily one third of the way into the frame. A diagonal interest might also help. The truck, for instance, could be firmly incorporated into the landscape if placed on a road passing diagonally into the distance.

A light in the darkness

Another possibility, particularly in cityscapes, is to include a light source in the picture frame. A traffic sign, for example, may be used to enliven a dull street. Here, the advantage of one light would be wasted if numerous neon signs and streetlamps were also in the frame. Remember when including artificial lights that they are not compatible with daylight-balanced film and fluorescent or mercury streetlights may appear a strange green on film unless appropriate



G. Sommer/Explorer/Vision International

Lighting on a budget

Lighting does not have to be complicated to be effective. It is possible to equip a very comprehensive home studio at a low cost by using inexpensive and versatile tungsten photographic lamps



Martyn J. Adelman

Light is essential to photography. Without it, you would be unable to take pictures. But whereas the use of available light will normally give satisfactory results out of doors, you will often require artificial light if you wish to take good photographs indoors.

Full studio lighting can cost a lot of money, but if you choose carefully from the range of budget equipment available, you will be able to create excellent and easily controllable sources of artificial light for a relatively modest outlay.

There are basically two methods of providing light for an indoor subject—flash and tungsten lighting.

Bulbs

The term *tungsten lighting* is generally used to describe sources of light that are illuminated continuously, rather than lighting up for a very brief instant

in the way that a flashgun does. Because it is a general term, tungsten light is used to refer to all sorts of light sources, ranging from ordinary household bulbs to football stadium floodlights. For photographic purposes, the type of tungsten lamps that are most commonly used range from 275 watts to 1000 watts, though for the home studio anything brighter than 500 watts is rather unmanageable. Lamps dimmer than 275 watts emit light that is too yellow in colour, and are therefore not really suitable for colour photography.

There are many different types of lamp which are made specifically for photography, but the most useful of these, as far as the non-professional user is concerned, is the photoflood bulb.

Photofloods are made in a variety of sizes and power outputs, the outputs of the most popular sizes being rated at

Schoolboy still life For this sort of still life, a cheap, simple lighting set up is perfectly adequate to achieve well lit pictures

275 watts and 500 watts. Although photofloods look very similar to domestic light bulbs, they are made with a different electrical element within the glass globe. But photofloods get much hotter, shine brighter and last for less time than conventional light bulbs. Their most important advantage, however, is that they burn with a bluer light.

Photofloods have a colour temperature of around 3400 kelvins, (see pages 220 to 221) which makes them much more suitable for use with tungsten balanced colour slide film than conventional light bulbs. Some filtration must still be used, though, because tungsten film is balanced for light with a colour temperature of

3200K (see films and filters, below).

The cap fittings of photofloods are the same as those of ordinary domestic light bulbs, so they could be used in place of ordinary bulbs. Although this is feasible with the smaller bulbs for short periods, it can be dangerous to use large photoflood bulbs in fittings that have not been specifically designed for this purpose. The bulbs heat up very rapidly, and could damage light fittings in a few minutes. A burnt out lampholder may just mean a blown fuse, but there is a serious risk of fire if the bulb touches flammable material. Photoflood bulbs, particularly the larger ones, should be used in ceramic lampholders with metal fittings.

There are other types of tungsten lamp available, some of which offer significant advantages over photofloods. Photo-pearl lamps, also called Argaphoto bulbs, are in many ways similar to photofloods—they consume either 500 or 1000 watts and have a colour temperature of 3200 kelvins, which means that they can be used with tungsten film without the need for filters. The major difference between photofloods and photopearl lamps is in burning time: photopearl bulbs burn for 100 hours or so, while photofloods will burn out after only 3 to 6 hours. Although the cost of the longer lasting bulbs is as much as five times greater than the cheaper photofloods,

they cost less in the long run.

Photoflood lamps are now commonly called 'photolamps' and photopearl lamps are generally known as 'tungsten (3200K) lamps'. Without the colour temperature in brackets the term tungsten is virtually meaningless because all filament lamps have tungsten filaments.

Lampholders and stands

On its own, a bulb is useless—it needs to be supported and its light directed. There are a variety of lighting systems on the market which provide a good selection of stands and lamp-holders, and can be fitted with a number of different reflectors.

There are three common types of lamp fitting available for photographic purposes—one is a bayonet cap (BC) fitting, and the other two are Edison screw (ES) fittings. Some photographic lamps are available in a choice of fittings, but all photoflood and photopearl lamps that are likely to be used at home are available in the smaller of the two Edison screw fittings. It makes sense, therefore, to base any home studio around this one standard size, which is also the size most commonly used in domestic screw-thread light fittings in Europe and the USA.

Most domestic light fittings are made of plastic, and while this is a perfectly

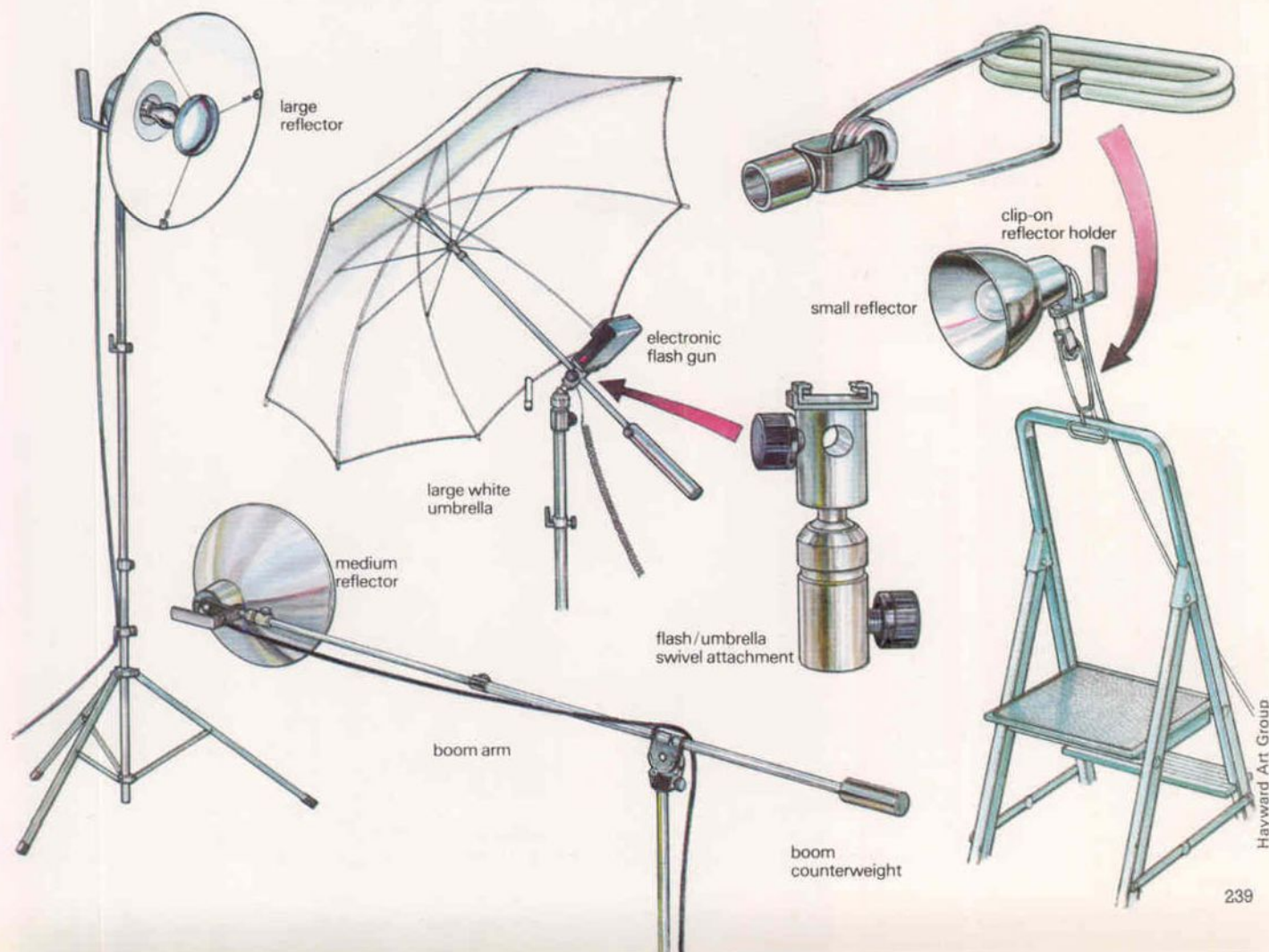


Photographic lamps The opal bulbs are photofloods—two are 375W, one 500W. The clear bulb is an ordinary 60W lamp

suitable material for bulbs up to 200W, it will probably char or melt if used with powerful photographic lamps. If you plan to use one of the more powerful bulbs for extended periods, make sure that the lampholder you buy is made of metal, and that the insulators inside are made of a ceramic material—you should be able to see these insulators by looking into the lampholder with the bulb removed.

Lighting stands for the lampholders are available in a wide variety of shapes and sizes. They are usually collapsible, and fold up quite small for ease of transportation. The more portable stands are made of aluminium alloy—this makes

Budget lighting Even unexpensive lighting systems offer a choice of stands and reflectors. Some allow you to use your electronic flashguns as a light source



them a lot lighter to carry around. Unfortunately, aluminium is both expensive and rather soft, so the better makes of aluminium stand are quite substantially built, and therefore tend to be quite costly. If you intend to use your lighting frequently, or if you will have to carry it around a lot, it is probably a good idea to spend your money on heavy duty types.

On the other hand, most amateur lighting set-ups are used infrequently, being stored in a cupboard when not in use, and in such a case a strong aluminium stand would be a waste of money.

The most rigid types of stand are those made of aluminium tubing. Although the stands constructed from aluminium extrusions are adequate for most purposes, they can be more difficult to assemble, and are not usually quite as steady as the tubular type.

Cheaper stands are often made from pressed steel—they have telescopic steel tubes in the centre, and flat metal strip legs. These stands only extend to about 2 m, but this is usually adequate for portraits and still life photography in the home. When these are not being used they can be stored in boxes which take up very little space.

It is very useful to be able to get a light down low, almost at floor level. This is sometimes necessary when lighting a portrait, because a low light can be used for backlighting—it will come from behind the subject, but will not be visible in the picture. In such cases you can buy a small tripod attachment which will take the lampholder. Some manufacturers produce a clamp that can be fitted to one leg of a lighting stand serving the same purpose.

Lighting stands are not the only means of fixing lamps into position. Strong spring clips are available that have a lampholder and reflector attached. These can be fixed to the back of a chair or onto a shelf, and usually have a ball and socket joint which allows the lamp to be pointed in a number of different directions. These devices work well for improvised lighting set ups, and can be usefully pressed into service as extra reading lights when not in use for photography.

Another useful accessory that comes in handy for occasional photo sessions is a small steel bracket that hooks over the top of a door. Most internal doors have a small amount of clearance at the top, so the door can often be closed with the bracket in place. The light is then fixed onto the bracket, which again has a ball and socket joint so that it can be pointed in the required direction.

Getting a lamp above a subject is often a problem, particularly for portraiture where a dark haired sitter will need extra light on the hair for good results. A long horizontal bar is usually used for this purpose, with the lamp fixed to one end. A counterweight is attached to the other and the whole arm, called a *boom*, is clamped to the upright of a lighting stand. The lamp hangs above the sitter's head, but does not appear in the picture.

Reflectors

Even the most inexpensive lights can be used with a range of different reflectors. As a general rule, the smaller the reflector, the sharper and harder the light source will appear to be. A bare light bulb is the most extreme example, forming very hard, abrupt shadows. It also wastes a lot of light.

A small shiny reflector directs more light from the bulb onto the subject, but still forms fairly hard shadows. A larger reflector is less efficient in concentrating the light from the bulb, but produces less harsh shadows. Very large reflectors give extremely soft illumination, with very gentle shadows, but the light is spread out so that it is much dimmer.

These three types of reflector can be fitted to most types of economical lighting units. They are generally made from spun aluminium, which makes them light, reflective, and easy to move around. The smallest reflectors are usually about 17 to 18 cm across, and are highly polished inside. They are best used for backlighting, where a small source of light is required, or for a dramatic main source of light. They produce narrow beams with little spread.

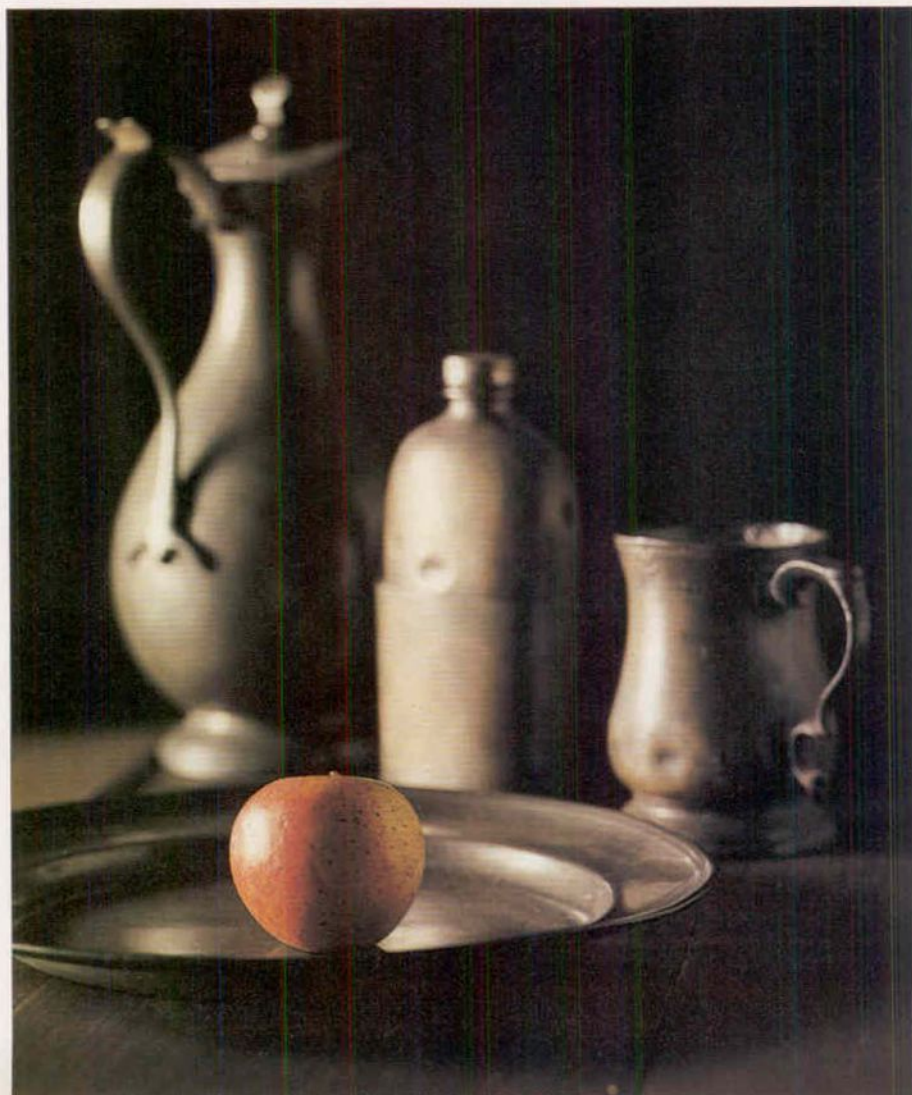
General purpose reflectors are not so highly polished, measure about 24 cm across, and produce a softer, wider beam of light. This is the type of reflector that is supplied as standard with many lighting units.



Hard light The smallest reflectors produce a concentrated, harsh beam

Fill in reflectors are much larger—40 cm or bigger, and are painted matt white on the inside. They often have a cover which prevents light from reaching the subject directly from the bulb. These reflectors are used to fill in harsh shadows in a picture, without forming disturbing secondary shadows themselves. They are also useful as a soft, flattering main light for portraiture.

Some photographic lamps also have a reflector built into the bulb. Since the reflector is fixed in place these bulbs are of limited use. They produce fairly narrow beams of light, and can be pressed into service as a last resort.





Slightly softer Medium size reflectors form a beam that is marginally softer



Big and soft Large white reflectors are much more suitable for portraits

Lighting accessories

The most expensive lighting systems have custom built systems of accessories available, such as *barn doors* and *snoots*. Barn doors are black metal flaps that control the area of the subject that is lit by the lamp, and can also be used to prevent light falling directly on the camera lens.

Although these are rarely made for the cheaper lighting systems, a substitute can be improvised using pieces of black card and a pair of spring clips.

A snoot is a long cone-shaped cover that is fixed to a lamp to produce a small spot of light on the subject. Some of the cheaper lighting systems have snoots available, but you can easily make snoots for lights without them from black card and adhesive tape.

Dimmers and cost-cutting

Tungsten lights are expensive to run—the bulbs are costly and use a lot of power. The lives of photoflood bulbs are very short, and towards the end of their working life the colour of the light they emit becomes redder. For this reason, many photographers use a dimmer in the lighting circuit. This is set to a low level for focusing and composing the picture, and is turned up to full power for the exposure itself. Since the power to the lamps is reduced, they consume less electricity. The life of the bulbs is prolonged considerably—an eight per cent cut in voltage to a photoflood doubles the life of the bulb. It is easy to see that the use of a dimmer can halve the number of bulbs used.

Cutting the voltage to a bulb also lowers the colour temperature of the light, so it is important to remember to turn up the power before pressing the shutter release on your camera.

The same effect can be achieved by using a series/parallel circuit. This has a two-position switch with one position for exposure, and one for focusing. Un-



Flattering flash Best results are produced by flash and an umbrella

fortunately, it can only be used with even numbers of bulbs, and will not work if one, three or five lamps are in use. Some manufacturers produce ready made units of this type, and even if they are unobtainable, any competent local electrician should be able to make one up to order for minimal cost.

Flash for the home studio

A lot of professional photographers prefer to use electronic flash for studio work, and it is easy to see why. Electronic flash does not heat up in the same way that tungsten light does—and it freezes all movement in the subject. Daylight balanced colour slide film can be used with electronic flash, which is an advantage, because there is less choice of film balanced for tungsten than there is of film balanced for daylight.

Professional studio flash units are often very powerful, and most of them are extremely costly, usually quite out of reach of the amateur photographer. The advantages of using flash are so great, however, that many people use small portable flashguns as light sources for portraiture and still life indoors. The biggest drawback to this is that you cannot see the effect that the flashes will have until you develop the film, and you cannot use a conventional meter to measure the light. Professionals get round these problems by using *modelling lights*—small halogen bulbs placed

close to the flash tube to simulate the effect of the light—and by using flash meters. Polaroid test shots are also used as lighting checks.

Few of these possibilities are open to the amateur, and a portable flashgun is a poor substitute for a custom built studio unit. However, the versatility of a small flashgun can be increased by using accessories designed to direct and control the light. The most useful of these is a bracket that enables a portable flashgun to be directed into a reflective white or silver umbrella or *brolly*. This produces a much more diffuse source of illumination than direct flash, though much of the flash's power will be lost.

The advantages of a *brolly* are that it is the correct shape for a directional reflector, with the flashgun at its focus pointing into the umbrella, and that it can be folded up for convenient storage.

Umbrella brackets are usually quite cheap, and are made to fit either onto a tripod, or onto a conventional lighting stand. Since the area of the umbrella reflector is quite large, the light produced by such a unit is soft and gives gentle shadows. Quite acceptable portraits can be produced by using just one umbrella and a fill-in reflector.

Films and filters

Most colour films are carefully balanced to give perfect results in sunshine—light with a colour temperature of 5500 kelvins. Electronic flash emits light with this colour temperature, so daylight film will give good results with flash without any filtration on the camera lens being necessary.

If daylight balanced colour slide film is used in tungsten light, the pictures will have an orange cast. This can be prevented by the use of an 80B blue filter over the lens, although even this precaution may not result in perfect colour reproduction.

The best solution when using tungsten lighting is to use film that is specifically balanced for this kind of light. Tungsten balanced film, such as Ektachrome 160 Tungsten, will give accurate colour when used in light with a colour temperature of 3200 kelvins. Photoparl lamps have this colour temperature, so they can be used without filtration when the camera is loaded with tungsten film. Photoflood lamps are slightly bluer in colour. They have a colour temperature of 3400 kelvins, and if they are used without filtration, they will give a pale blue cast to pictures on slide films. The solution is to use an 81A or an 81B filter. Either of these filters will eliminate the blue cast from the picture, but the 81B has a more pronounced effect.

Colour print film is only available in a daylight balanced version and, though correction can be made at the printing stage if the film is exposed in tungsten light, it is better to use an 80B blue filter over the lens for photofloods or an 80A for photoparl lamps. This will give better colour reproduction, and make printing the negative that much easier.

Peter Dazeley/Lighting by Photax (UK) Ltd

Solitary apple The lighting for this picture was very straightforward—just one lamp in a large white reflector on the left of the subject, and a reflecting sheet on the right to put some light into the shadows

Wildlife in the park

You do not have to go on a wildlife safari in deepest Africa to get fine nature shots. Opportunity is as near as your local park, with the added advantage that the creatures are quite used to people

In the ordinary environment of a public garden, nature subjects are accessible to any amateur photographer. We asked David Hosking, a young professional photographer noted for his bird studies, to shoot his favourite subjects in Kew Gardens, where he located 17 species in five hours.

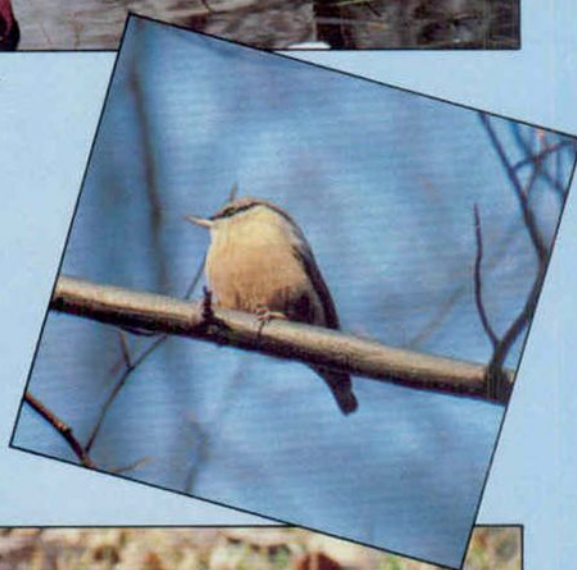
As it was a dull day, he loaded one camera body with Ektachrome 200 and the other with Kodachrome 64. The feeble yellowish sunlight of a winter's day required a fast film, and David shoots only colour transparencies. The faster films are important to him because one of his main lenses is a 400 mm.

'Nature photographs should be in colour. I feel black and white is more of an art medium.' He pointed out that you can always have a black and white print by making up a black and white negative from the colour transparency.

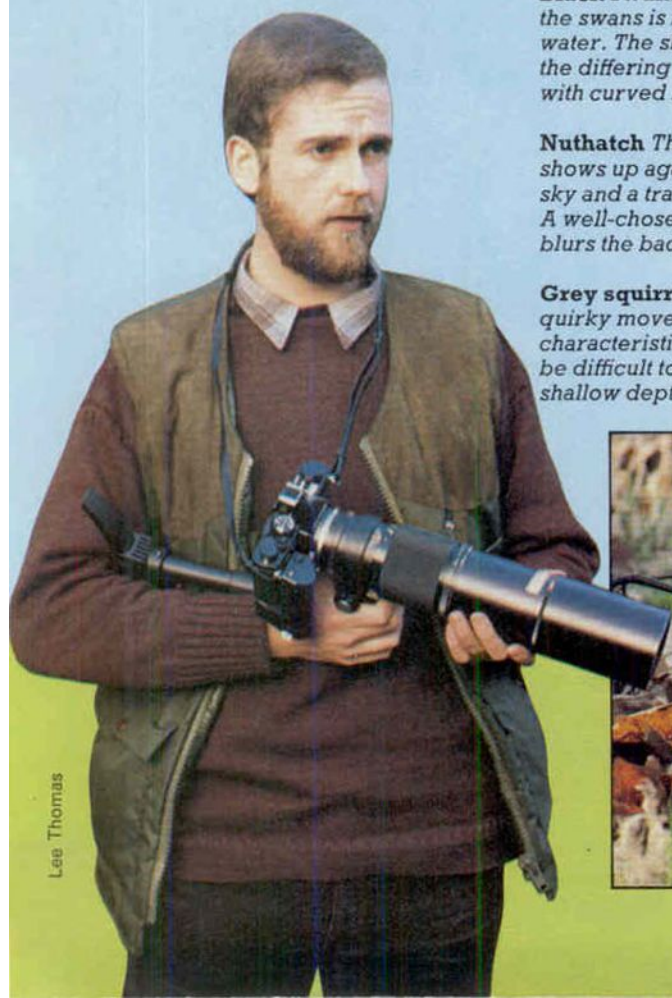


Black swans The graceful beauty of the swans is reflected in the still water. The shot looks the better for the differing poses of the birds, one with curved neck and one alert

Nuthatch The tiny nuthatch shows up against the very blue sky and a tracery of branches. A well-chosen depth of field blurs the background branches



Grey squirrel Sudden, quirky movements are characteristic of a squirrel. It can be difficult to catch him with a shallow depth of field





Male silver pheasant Each feather is clearly delineated on this magnificent bird, caught with a 135 mm macro lens as he stalked across the grass. Relatively tame birds in parks allow you to get very close shots



Mallard ducks
This is a typical species identification shot of male and female

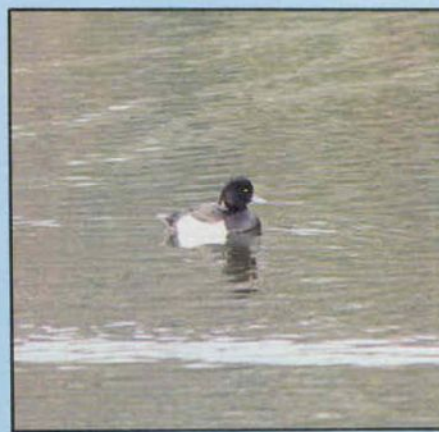
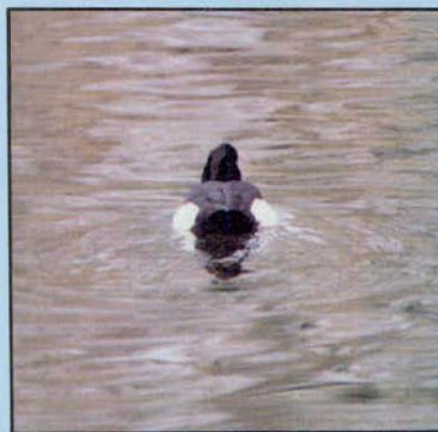
David used six films before the light failed. He is quite ruthless in discarding shots that do not work, sometimes discarding the whole roll. He feels that the main difference between a professional photographer and an amateur is in the discards. An amateur might keep a shot that was not properly focused for its great composition and what it might have been, but the pro looks for any faults and does not keep a near-miss. David said that though his shooting ratio varies from zero percent to 100 percent, he feels happy if he gets one good shot per roll.

'If they're not worth captioning, they just get thrown away. When I heard that you needed my discards, I literally rescued them from the wastebin.'

The shot of the robin with its head and red breast hidden by a branch was a discard, as was the one where the tufted duck turned its tail and paddled off. Of the gull photo he says, 'There you see quite a boring picture of some gulls on a dish, and also you notice that the dish is slightly slanted, so I've corrected that.' He also rid the background of the blurred urn.

He used a shoulder brace, as one must get written permission from park authorities to use a tripod. Birds are his favourite subject, and he finds children by far the most difficult.

'If you can take pictures of kids, you can photograph anything—and wildlife photography's easy after that!'

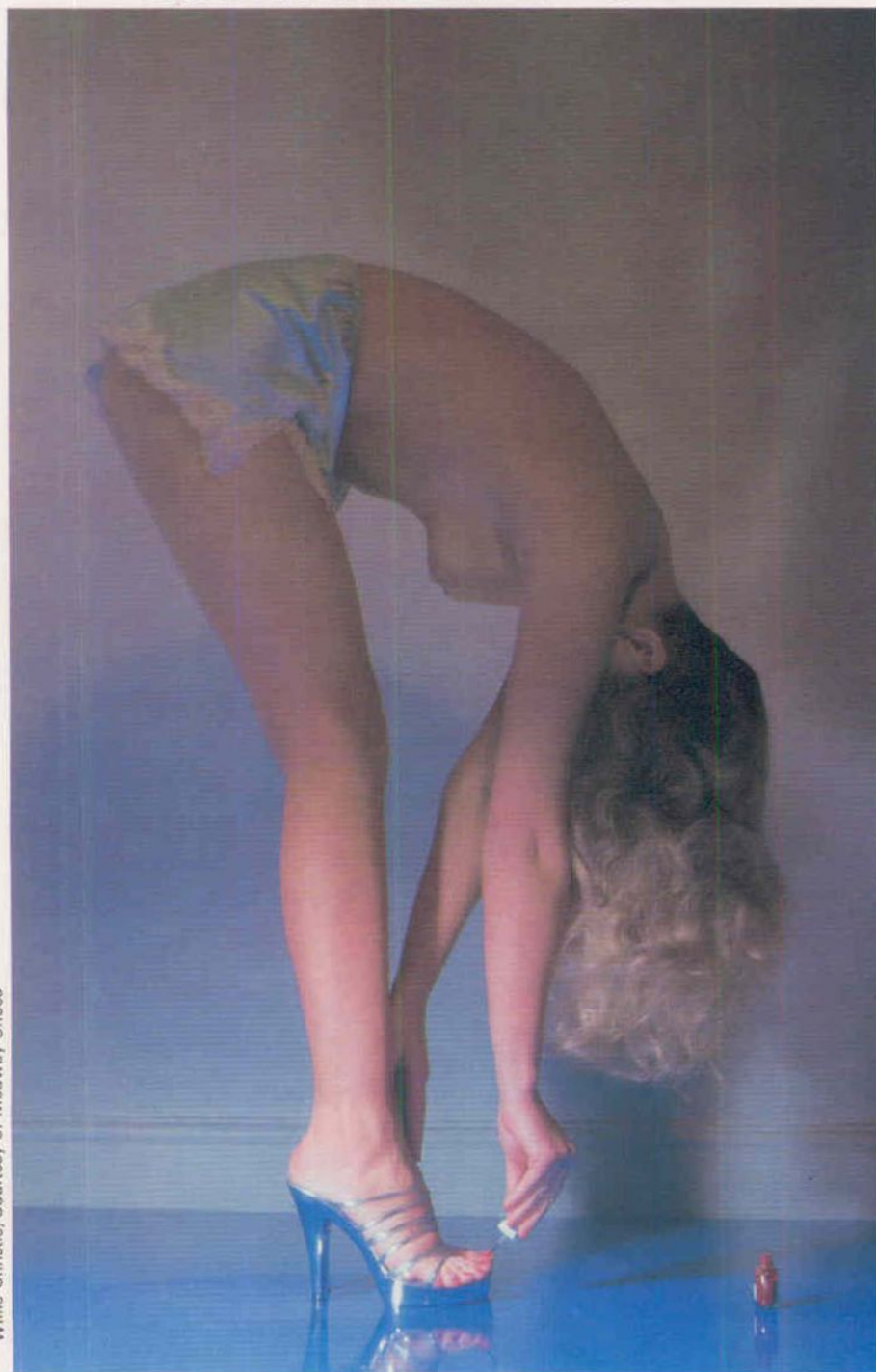




World of photography

Willie Christie

The world of fashion has always attracted photographers but only a few make it to the top. Willie Christie is one of those whose pictures regularly appear in glossy magazines



Willie Christie/Courtesy of Medway Shoes

Glamorous men and women, glamorous clothes and exotic locations—fashion photography seems to have it all. But because the aim is to focus attention on the fashion rather than the photographer's technique, it is easy to underestimate the amount of expertise and effort that goes into producing top quality fashion shots. Good fashion photographers are, in fact, remarkably skilled members of their profession and Willie Christie is no exception.

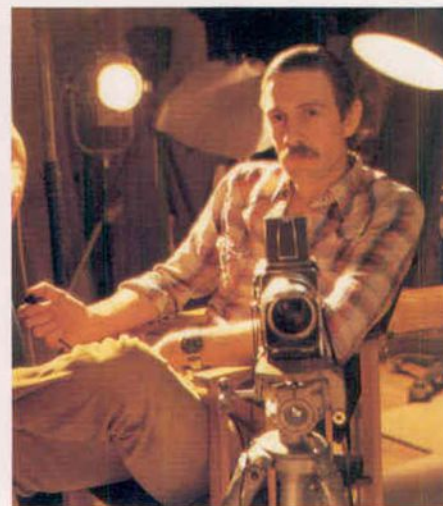
At 32, Willie Christie is one of the stars of Britain's fashion photographers and an international name, yet he landed in photography almost by chance and certainly without any previous ambition. After leaving school, Willie wanted to get a job in the movies. But while he was searching around for an entry into that closed industry, a fashion photographer friend asked him if he would like a job for a couple of weeks 'humping equipment around' while one of his regular assistants went on holiday. It did not seem anything special at the time.

Two weeks later Willie was hooked, and went on to spend the next three years as an assistant in various studios. By that time he had learnt enough to branch out on his own as a fully-fledged professional. Although he learned much from other professionals, he was soon able to develop his own highly individual characteristic style.

'The first two or three years of being on my own was quite a struggle,' Willie recalls. 'I didn't starve. I was getting occasional work from several of the lesser-known magazines and even a few small assignments from *Vogue*. It wasn't the kind of photography that I had set my mind on, but it was all that I could expect at the beginning and, although they were only occasional,

Shoes and sensuality *A far cry from the standard shoe shot. Willie used daylight film and lit his subject with filtered tungsten lamps*

Willie Christie *This self-portrait was taken in his London studio using a cable release and shooting the reflection in a mirror*





and Yardley beauty products.

His workload is now so heavy that he needs a permanent staff to help him at the studio, including a secretary, a young assistant, and a set designer, Chris Drake, who used to be his assistant. Chris is also now a photographer in his own right, building sets and photographing them for decor and furnishing magazines such as *House and Garden*. Sharing the studio is a very convenient arrangement for Willie who is often away shooting on location.

Team work

Although many photographers prefer to work alone, the team work involved in producing the right shot is one of the great joys of fashion photography for Willie Christie. 'I like the whole ceremonial of it—the set design, the hairdressers and make-up girls for the models, the art directors and fashion editors, my assistant and I, all gathered on the set. The basic ideas for the shot have usually been worked out beforehand. Then on set the other people involved will contribute their own ideas. Then it is up to me to make sure that the lighting is perfect, that the model is posing properly and that I'm shooting her from the right angle to please the client and myself.'

A taste of colour Shot for a picture series about the colour green, this was eventually used as one of the covers for *Vogue* magazine

Beachwear Tracing paper was placed between the slats of a white wooden screen and lit from behind. Willie then used Balcar flash to light the model

most of the assignments were pretty interesting to work on.

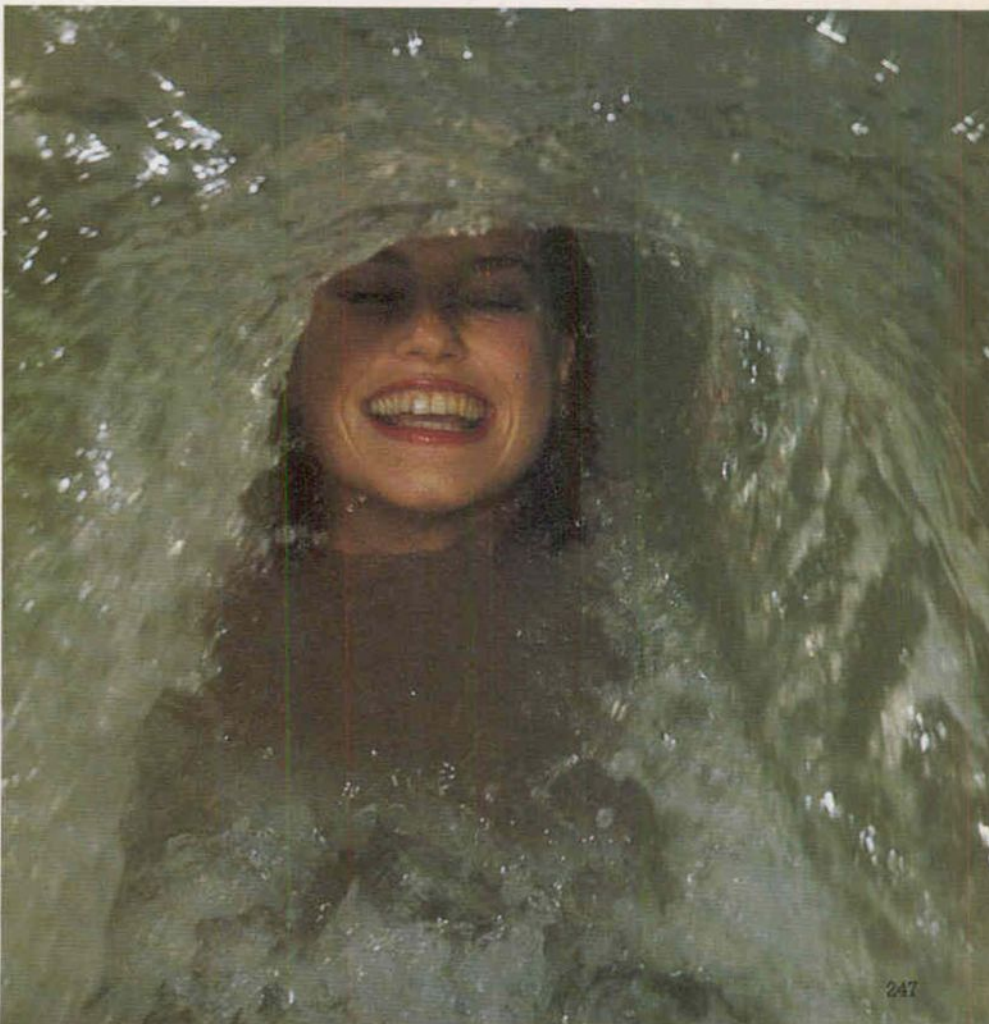
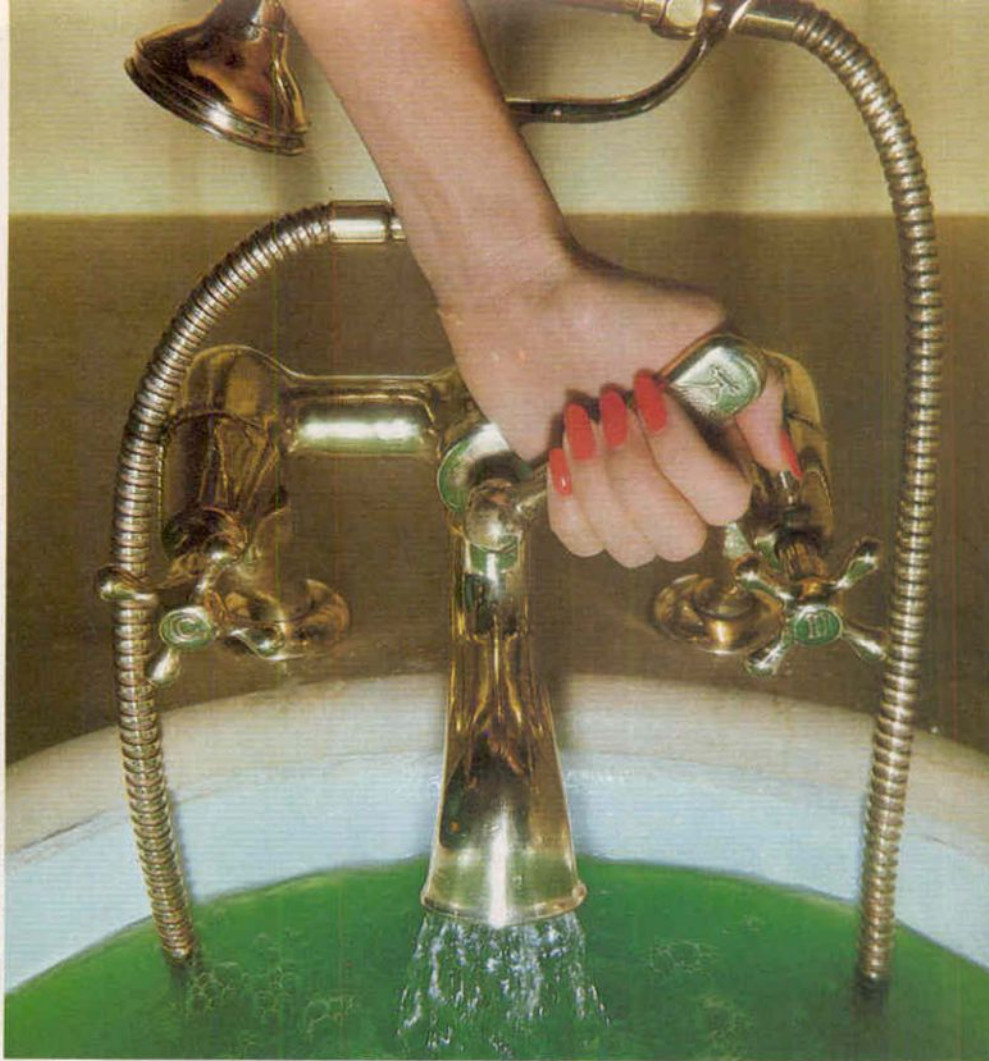
At this time, Willie did not even have his own studio and had to hire one whenever he did a job that needed a studio location. But later on he bought his own house and was able to convert the top floor to a studio. 'From then on, things seemed to change, the snowball suddenly started rolling and I was able to really start taking the kind of photographs I wanted to. Instead of having to telephone around town to get jobs, I started working regularly for a number of clients. Eventually I got regular assignments for *Vogue* and did most of my fashion photography with them. If you're working with *Vogue* you tend not to work much with other fashion magazines. Nowadays I work for a wider variety of clients, especially through advertising agencies.'

Now Willie has his own huge studio in London's fashionable Holland Park, together with an office, a darkroom, a workshop for building sets, and a changing room for his models. From his studio, or on location in any part of the world, he supplies fashion photographs to magazines like *Vogue* and *Harpers*, and advertising shots to large companies like De Beers Diamonds, Revlon





RIGHT: BOTH PICTURES REPRODUCED FROM BRITISH VOGUE · The Condé Nast Publications Ltd.



Night reflections *The set built for this shot was painted silver and lit with filtered tungsten lamps*

Bath time *An illustration for an article on nail care, taken on a 150 mm lens and lit with flash*

Surfing in Sierra Leone *For this spectacular shot, Willie stood in the surf and used a 150 mm lens*

By kind courtesy of the Observer Colour Magazine

When Willie is commissioned to do a job, the client usually gives him a detailed specification of the type of shot wanted. The scope to try out his own ideas varies considerably from job to job.

'With editorial fashion I have a lot of freedom to take my own kind of photograph. But advertising photographs are usually taken according to a pretty tight brief from the agency, and there's not much latitude for creative effects. Strangely enough, though, it is often the advertising sessions that give me ideas for the kind of shots I would really like to take, so that when the session is over, I sometimes carry on shooting for my own satisfaction.'

Obviously when working with a highly paid model he cannot afford to extend these informal sessions indefinitely, but he often gets his wife, Shirley, to model for him when doing advertising shots for shoes because, according to Willie, she has 'the finest pair of legs in the business!' When the shoe session is completed, he often

spends time taking pictures of Shirley.

Shooting to detailed specifications all the time might seem to be a recipe for boredom, but Willie finds that 'every session has some new and interesting aspect, though sometimes the excitement hasn't anything to do with photography.' He remembers being on location in Sierra Leone once.

'We were shooting swimwear photographs on a beach, some distance from the city. All the nearby villagers had come out of their villages to sit around and watch, and give each other their views on the session. It was an idyllic place, a beautiful sea with surfing waves, a wonderful sandy beach, and the model changed her costumes in the shade of the palm trees. But at four in the afternoon when the session was still swinging along, our driver turned very pale and started hurriedly packing up the equipment. We were rather taken aback and tried to tell him that we hadn't finished, but he was adamant. It turned out that he was terrified as he had heard tales of

cannibals in the area. It seemed rather a tall story, but the villagers had gone too, so we followed. When we arrived back at our hotel in Freetown, the people there confirmed that several people had disappeared in the area where we had been shooting. From then on we decided to follow his advice, although we never quite believed in the cannibals!'

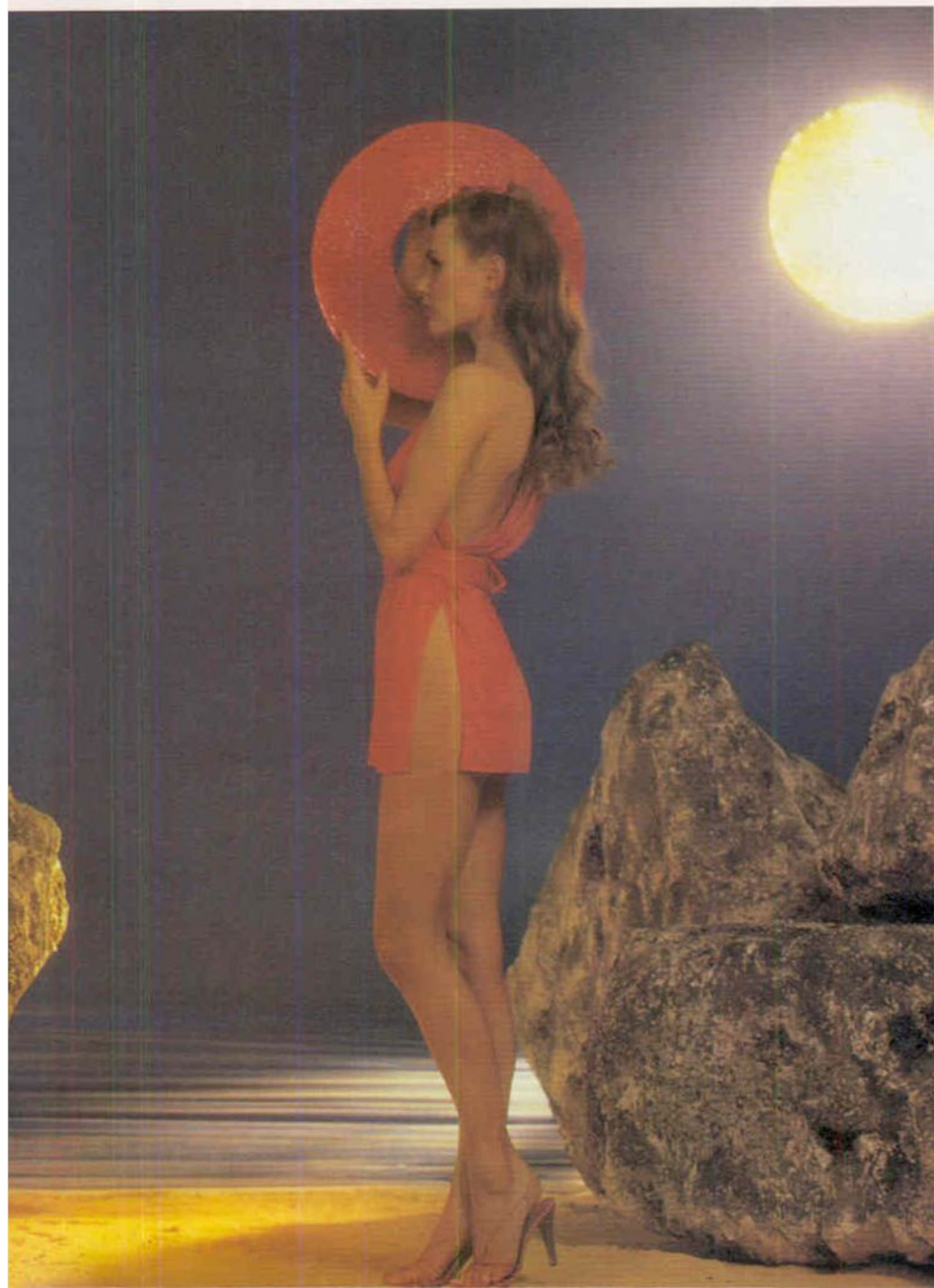
Few sessions are quite as traumatic as that, but every assignment has its own tempo, its own atmosphere and interest. Recently, Willie has been doing promotional work for *Vogue* rather than straight editorial fashion. Promotional photography in *Vogue* involves advertisers who want their photographs to tie in with the style of the magazine. 'Sometimes two advertisers get together, like a fashion house and a jewellery company or a car manufacturer, so you photograph both together. Sometimes this can be harder as the products are vying for attention—unless the manufacturers have clearly agreed on which product has top billing.'

Equipment

For a photographer who specializes in a subject as sophisticated as fashion, Willie Christie's equipment is quite simple. 'I nearly always use 2½ in. square format film, and only very occasionally shoot on 4 × 5 in. The quality of today's colour film is good enough for reproduction to almost any size. Larger formats are only necessary for extra large posters like those on the 'Super-

Sun, sea and sand A promotion for a suntan lotion company, this shot was taken in the studio using polystyrene rocks, builder's sand, and wrinkled clear plastic laid over blue PVC

Glamorizing jeans Willie hired the car, fur coat and Cartier jewellery for this shot. The model is Jerry Hall



By kind courtesy of L'Oréal



Fashion at Loch Ness One of a series of fashion shots for *Vogue*. This picture was taken with a magenta filter on his Balcar flash outfit

sites' used by airlines and a few other advertisers.

'When I'm shooting colour which is nearly all the time I usually use Ektachrome 64 ASA daylight film and use blue gelatine filters over the lamps rather than use an 80B filter on the lens. This is because I sometimes want to give a warmer tone to one area of the photograph, usually the model. I can do this by simply leaving the blue gelatine off one or two of the tungsten lamps. If I'm shooting on black and white I'll use Panatomic-X 32 ASA for really fine grain work or Tri-X 400 ASA.

'I use two Hasselblads with just three lenses, a standard 80 mm, a 50 mm and a 150 mm. I rarely use filters, although I sometimes use the 81 series for warming the tones in fashion shots. But when you are shooting advertising, the agencies are very particular over the colour

balance of their product packs. They have to be absolutely exact, so I don't usually use filters for that kind of work.

'In the studio I mostly use tungsten lighting. I have three Balcar flash outfits but I find tungsten light is much more easily controllable—what you see is what you get. With flash you would need to control the light with dozens of flags and gobos to achieve the same effect. A flag is a piece of card set up to stop the light from a lamp reaching a part of the subject of the shot. Gobos are boards which reflect the light from the lamps on to the subject so that the light is muted.'

'When I go on location I always take a flash outfit with me. I used to take my Balcar together with a little Honda generator for the power pack, but now I use the much handier Braun 910 flashgun. It has a power of 200 watt-seconds which is amazing for a portable flashgun, and it gives me all the light I need.

'I need flash on location to put in highlights on the models. In medium bright conditions I'll be shooting at 1/500 second at $f/5.6$ or $f/8$. The flash will

pick out the model but the surrounding scenery and the sky will be underexposed by a stop or two to give a dark and dramatic effect.'

But equipment is only a means to an end. The success of his photography is undoubtedly due to Willie's own eye for a picture and it is his individual approach to the subject that has made his name. 'The way I take photographs, my style, is a very personal thing, and it is, I hope, always developing along with my ideas and experience.

'What I really like about fashion photography is that it sets my adrenalin flowing. There is no particular element in fashion photography that is especially important to me. It is more the act of combining the different elements that I enjoy. It can be like designing and building your own house. You have to be a good technician and able to deal with all the practical elements of the job but the creative excitement comes from bringing all your skills together and directing those of your associates to create the desired end result.'



Darkroom

Contact prints

A whole length of film printed on a single sheet of paper shows you what each picture will look like when printed. This contact proof print also serves as a valuable aid to enlarging

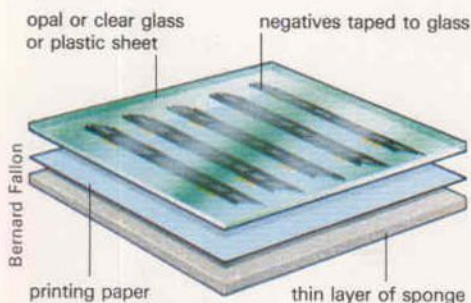


Having learned the basic principles of black and white printing, it is tempting to move straight on to full scale enlargements, but even the most experienced photographer cannot always tell how a photograph will turn out simply by looking at the negative. To get the best from your negatives, you should not only make test strips but also contact prints before you make your enlargements. Contact prints are simple to make but provide a wealth of useful information. With the aid of a good set of contact prints you can:

- Decide which pictures on a roll of film are really worth enlarging.
- Choose the right contrast grade of paper for your enlargements.
- Estimate the exposure your enlargements need, and see if shading or burning-in is needed.
- Work out how to crop your pictures so that they have the greatest possible visual impact.
- Discover whether you need to make any adjustments to your film exposing or developing technique.
- Set up a filing system to help you locate the negative for any of your photographs quickly and easily.

Equipment for contact prints

The equipment needed for making contact prints is almost the same as that used for making enlargements and the only major extra item required is a contact printer. Most contact printers consist of a sheet of glass that hinges open like a book from a solid base. Strips of plastic or clips hold the negatives in place against the underside of the glass. A foam pad presses a sheet of printing paper against the negatives when the printer is closed. It is possible to do without a contact printer; you can make contact prints with a sheet of glass and a pad of foam or newspaper instead, but this is not so convenient. You will need to attach your negatives to the glass sheet with small pieces of cellulose tape if you use this method.



Contact printing If you decide not to buy a purpose-made contact proof printer, a makeshift alternative can be made from a thick sheet of glass (with ground edges) and sponge

Contact proof print You can use a proof print to determine in advance which negatives are worth enlarging, and whether or not a special enlarging technique such as dodging is required



Filing system One of the major uses of a contact print is to help you find a particular negative quickly once you have a filing system

Another item you will find useful is a magnifier. A hand magnifying glass is suitable, or you can use an inexpensive loupe available from most photographic shops, or a fold-up thread counter.

Setting up

Contact prints do not need to look good; they only need to provide useful information. The most important thing is to be completely consistent in the way you expose and process your contact prints. If you take care to make them in exactly the same way each time, you can make useful comparisons between different rolls of film that you have to print in the future.

Before you begin to make contact prints, you must find out the proper exposure they will need. To do this, make a test strip for each type of black and white film you use. This is a test strip with a difference—unlike most test strips, this one should have no image on it at all.

Next time you load a roll of your usual black and white film in your camera, place the lens cap over the lens and fire off a few blank exposures before you start taking pictures. When your film is processed, this gives a strip of film which is blank except for the manufacturer's edge marking and frame numbers.

In the darkroom, take this strip and place it in your contact printer. Under safelighting, place a sheet of normal grade printing paper under the strip on the printer baseboard and close the printer. You do not need to use a whole sheet of paper for this test—a strip cut from the long edge of a sheet is enough.

Place the printer on the baseboard of your enlarger and, with the red safety swing filter in place, switch on the enlarger. Adjust the height of the enlarger head until the projected light just covers the entire area of the contact printer. If your enlarger has a height scale on the column, read off the height of the enlarger head above the baseboard. Otherwise, use a tape measure to find this distance. Record the figure in a notebook so that you can later mark this information on the contact print, along with all other exposure details. Close the enlarger lens aperture down two stops. Then switch the enlarger off and swing the red safety filter aside.

You are now ready to make a test strip. The procedure is the same as for ordinary test strips (see pages 164 to 167). Cover the strip of film and sheet of paper underneath with a piece of opaque card, and switch on the enlarger to make a series of exposures, moving the card to uncover 5 cm of paper at each step. Make a note of the exposure time given to each segment of the test strip, together with the lens aperture, enlarger head height, make and grade of paper, and type of film being printed.

Develop the strip of paper in fresh chemicals at 20°C for exactly the time recommended by the chemical manufacturer. Wash and dry the print as if it were an ordinary photograph.

You should now have a strip of paper with a series of dark grey patches printed on it. One end of the strip should be completely black. Now establish the first exposure step (the shortest exposure time) on the strip that gives a maximum black patch. This step lies between a dark grey patch on one side and another completely black patch on the other side. The difference between the dark grey patch and the black patches should be very slight.

If there are no completely black patches on your test strip, repeat the test using longer exposure times. If the test strip is completely black all over, use shorter times for each step.

Make a note of the shortest exposure needed to give a completely black patch. This is the minimum exposure through the unexposed film base that will give the maximum black on the print. You should give this exposure to all your contact prints made from this type of film. Repeat the test when you change black and white film or developer type, or alter your processing technique.

This test is essential because most black and white negative films have a slight grey base tint. This is a characteristic of the film base and of the emulsion layer itself. It is referred to sometimes as *base fog*—base level plus fog density.

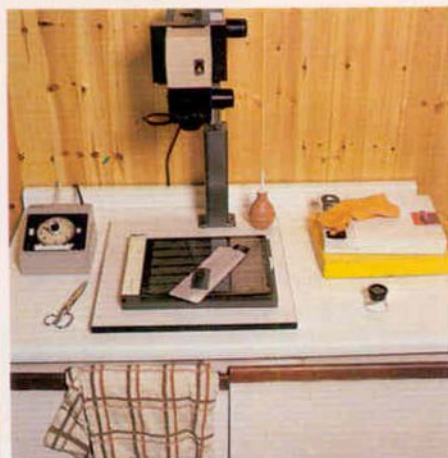
Different films have different grey base tints, and fog level can be adversely affected by poor storage and overdevelopment. But whatever the tint, you want the grey, unexposed areas of the film base to print as black as possible in your pictures since the lightest parts of the negative correspond to the deepest shadows of the original subject.

At the same time, you do not want to have to give the print any more exposure than the minimum necessary to produce this maximum black. When you make prints from your negative, the clear unexposed film base produces the deepest black on your final print, and any increase in negative density will print as a grey tone if you give this minimum exposure.

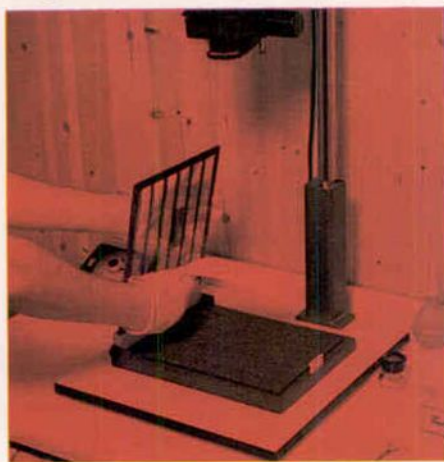
Making a contact proof print

Once you have found the minimum exposure needed to give the maximum paper black, you are ready to make a contact print. Clean the glass surface of the contact printer carefully with a soft antistatic cloth. Insert the negatives with their shiny base side facing towards the glass. The emulsion side of the negatives is slightly duller and should face towards

Making a contact proof print



1. In addition to your normal enlarging and print processing equipment, you need a contact proof printer and a clear strip from the processed film



2. The strip of clear film is used to determine the exposure time of contact prints made from similar films. Place it in the printer along with a strip of paper



6. Before loading the printer with a film you wish to contact print, carefully clean both sides of the glass using a blower and antistatic cloth



7. Use a cloth specially set aside for negatives to clean off fingerprints and drying marks you may notice on the shiny side of the film

topic Enlarging exposure times

There are four common ways of actually regulating the exposure time given during printing. This job must be done accurately if repeat consistency is required, particularly if test prints and contact proof prints are to serve any meaningful purpose: ● The red swing filter beneath the enlarger lens can be used only if you are careful not to knock or otherwise cause vibrations in the enlarger during print exposure times ● You can use a piece of card to shield the beam at the start (and end) of the exposure, to allow time for vibrations to die away before commencing exposure ● A lamp switch (not, for safety, the mains socket switch) is a convenient way of giving exposures, but be careful not to vibrate the head of the enlarger ● For the best results use an enlarger timer

the emulsion surface of the printing paper. You usually have to cut the film into strips of six or fewer frames.

Place a sheet of the same type of printing paper you used in your test in the contact printer. With the red swing safety filter in place, make sure that the contact printer is properly positioned on the enlarger baseboard. Switch off the enlarger and swing the safety filter clear before exposing the paper for the time determined from your earlier test.

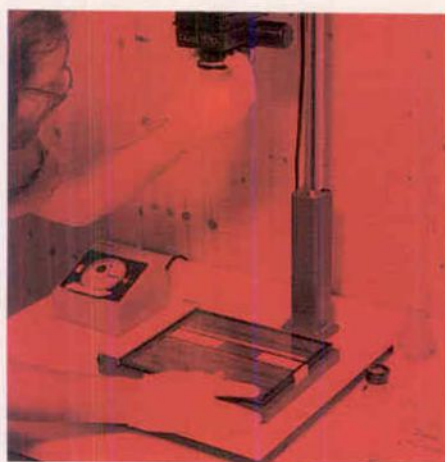
Develop, fix, wash and dry the contact print properly.

Evaluating the contact print

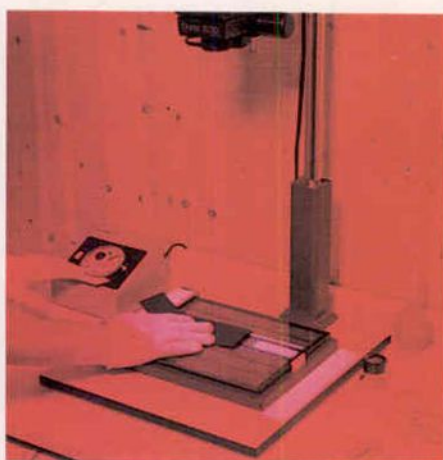
Examine the contact print in normal room light. Most of the frames should be sharp, detailed, and have a good range of tones. If they are not, and you have carefully followed the method outlined above, then the problem is not with your contact printing technique, but with your film exposure or development.

If most of the frames on your contact print are too dark, you have underexposed or underdeveloped your film. You will have difficulty making good prints from such a film—you will probably need to use a harder than normal grade of paper and short printing exposure times. If most of the frames are too light, you have overexposed or overdeveloped your film and you will need to use longer than normal printing exposure times and perhaps a softer grade of paper than usual. But stick to normal grade paper for your contacts.

If your contact print has the correct density overall, but is too contrasty, you have overdeveloped the film. If this is a recurrent problem, decrease your standard film development time in future. If the contact print looks dull and grey, your film is underdeveloped. Again, if this is a common problem, increase your film development time in future. But severe adjustments to



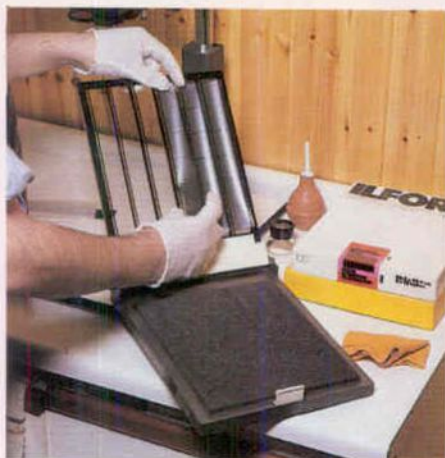
3. Under the safety of the red swing filter, check that the enlarger beam covers the whole of the printer. Note the head height, then stop down



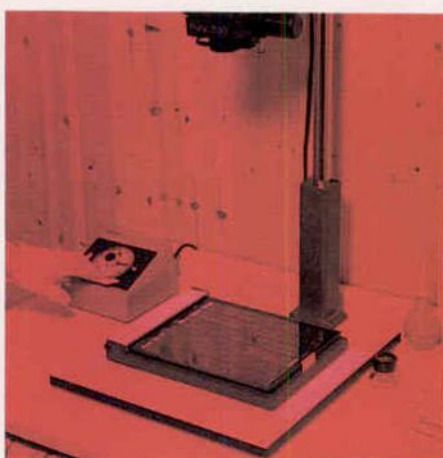
4. Cover all but one-fifth of the test strip and expose this for a set unit of time—5 seconds, say—and continue until a complete range of exposures is made



5. Take particular care to ensure that the test strip is correctly processed, washed and dried. Determine what exposure just gives a black segment



8. Carefully slide the negs into place, shiny side towards the glass. It helps if the frames are in order and the images are correctly orientated



9. Under safelighting again, load the printer with a whole sheet of paper and expose this for the period tested as being the standard for your film



10. To enable worthwhile comparisons, make sure the contact print is properly processed. From the dried print you can plan your enlargements

development time must be avoided. Experiment a little at a time to be on the safe side. Large adjustments mean altering exposure as well.

Your first few rolls of film are unlikely to give perfect results, but if you fine-tune your film exposure and development using your contact prints as a guide you will soon be producing negatives of excellent quality which are easy to print.

However, even when you find the best exposure and development combination for your film, you are bound to have a few shots which are not perfectly exposed, or in which the lighting contrast is too high or too low. Such pictures are immediately obvious on a contact print—they are noticeably lighter, darker, softer or harder than the other frames on the print. With a little practice, you can estimate how much compensation has to be made to print exposure or paper contrast grade.

You should use a magnifier to examine each frame on your contact print for signs of poor focusing or of camera shake. You can also estimate whether some areas of the print will be improved by shading or burning-in. Areas of the picture that are too pale need to be burned in; areas that are too dark to show detail can be dodged (for more about dodging see pages 222 to 225).

Sometimes pictures look better if unnecessary details are cropped out. A pair of small L-shaped pieces of cardboard can help you decide on the proper shape to make your print, and how much of the negative you should enlarge. Do not be too ambitious when you crop your pictures, however—the more you enlarge a small section of a negative, the more apparent becomes the graininess and unsharpness in the final print. Sometimes it is better simply to cut away the offending detail, to leave a smaller sized print. A chinagraph pen-

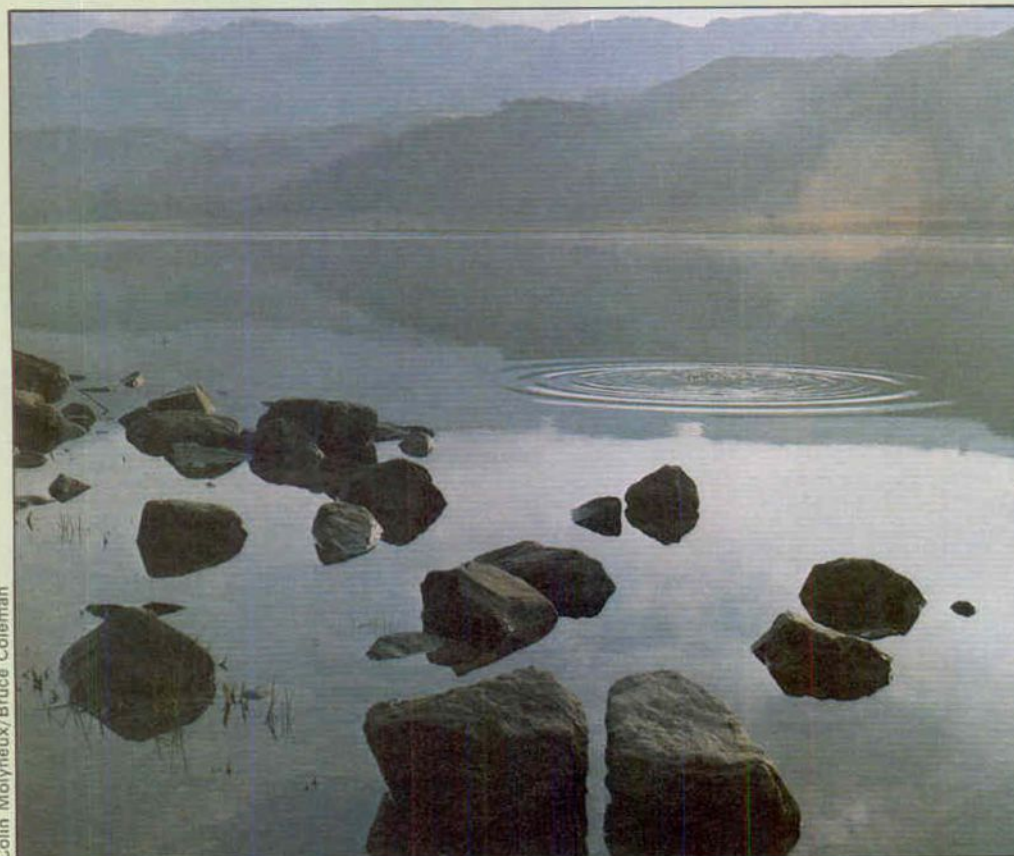
cil or a felt-tipped pen can be used to mark cropping lines and other exposure information on the contact print.

Your contact prints can form a valuable permanent record of your work. The most convenient way of storing your negatives is in specially-made filing sheets kept in a ring binder. If you file your contact prints in such a binder alternately with the negative filing sheets you can locate any negative you want simply by finding the corresponding contact print. Or, if you prefer, you can number your negative storage envelopes and write the same number on your contact print. As you build up a large collection of negatives, force yourself to weed out any films which are unlikely ever to be printed. With some experience, you will recognize badly exposed or developed films which are not worth enlarging or, for that matter, contact printing. But you might like to keep them as an awful warning!

Understanding...

Light and distance

Objects close to a light source are more brightly lit than those farther away. This drop in intensity is governed by a simple rule called the inverse square law



Colin Molyneux/Bruce Coleman

Anyone who regularly takes pictures using a flashgun knows that they only work up to a certain distance. If the subject is too far away, the picture will be underexposed. It is easy to see why—as the light spreads out from the flashgun, it covers a bigger and bigger area. The larger the area that it covers, the dimmer it gets, until the light is spread so thinly that it is no longer bright enough to expose the film and register an image.

This is most noticeable out of doors at night, particularly if the picture is of a group of people at various distances from the camera. If the exposure is adjusted so that those people in the middle of the group are correctly

Lake ripples As waves spread out, they get weaker. Light behaves similarly

Tiny chameleon Close-up pictures need extra exposure

exposed, anyone located closer to the camera will be overexposed—if they are very close, their images will be completely white and featureless. More distant subjects, even if they are only a little way behind those in the middle, will be underexposed, sometimes disappearing into the darkness altogether.

Even using an automatic flashgun taking flash pictures out of doors can be a risky business, as it is difficult to know just how much darker

distant objects will be compared to nearby objects. Fortunately, light always behaves in the same way, and if you understand its behaviour you can predict what it will do, even under unfamiliar circumstances.

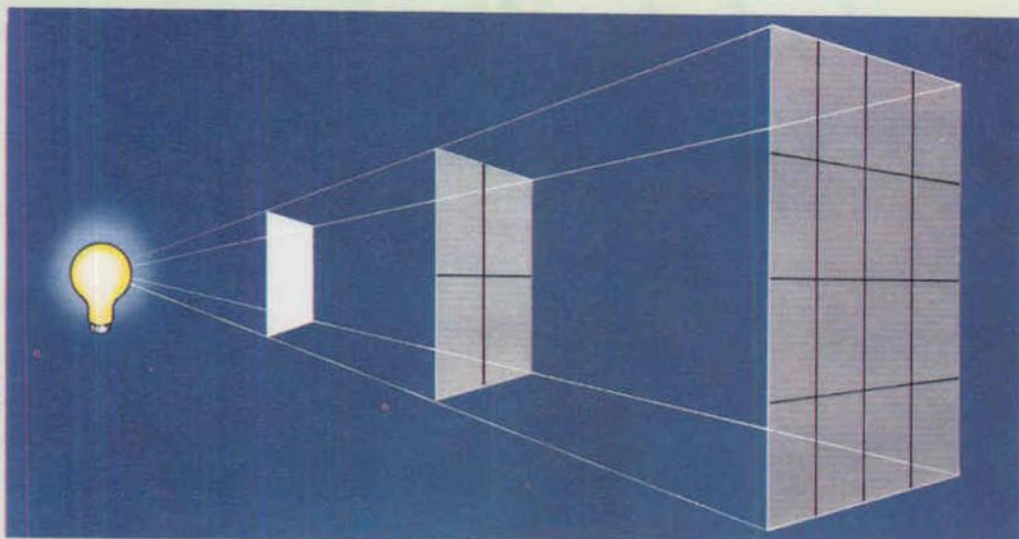
To understand how light waves work, consider waves of another sort—those from a pebble dropped into a lake. As the waves spread out in circles from where the pebble fell, they get weaker and weaker, until the ripples vanish altogether. The same thing happens with light, except that it takes place in three dimensions. Instead of spreading out in concentric circles like ripples on a lake, light spreads out in concentric spheres—rather like blowing up a balloon.

As light travels farther and farther from its source, its brightness is spread over an increasingly large area—the surface of the expanding sphere. The farther it travels, the bigger is the area that the light covers, and the lower is the intensity of the light. At any point, the light intensity is related to the distance from the source. If the distance is doubled, the light will have to cover four times the area, and the intensity of it will only be a quarter of what it was before. If the distance is trebled, the light will cover nine times the area, and the light intensity will be one ninth.

This idea—that the intensity of the light is related to the inverse of the square of the distance from the light source—is called the *inverse square*



Jon Danzig



Flash and distance *Light falloff is governed by the inverse square law*

law, and is a very useful tool in understanding how light works. The word *inverse* refers to the fact that as the distance increases, so the brightness decreases.

Practical application

Modern technology has eliminated much of the drudgery that early photographers were involved with, and complicated exposure calculations are now things of the past. Computer flashguns make night time pictures a lot easier, and eliminate all the counting on fingers that guide numbers used to require. But knowing how things work allows the photographer much more freedom than would seem to be the case if only the instructions that are packed with the equipment are slavishly applied.

The inverse square law crops up almost everywhere in connection with exposure—you cannot really get away from its far reaching effects. The most obvious example is connected with simple lighting procedures. If the subject of a picture is a portrait, lit by a photoflood, then moving the subject closer to the photoflood will have much more effect on exposure than would be expected. Cutting the distance between the subject and the light source by half will not double the light intensity on the sitter's face, it will quadruple it. Similarly, if the sitter is

moved away from the lamp to four times the original distance, the light intensity will fall to one sixteenth (four squared — $4 \times 4 = 16$) of what it was before.

In the darkroom, using the inverse square law can save you time, trouble and money. It is frequently necessary to make changes to the size of a print—you might like the look of a small print and decide that you want to make a bigger copy. Making a new test print is time consuming and costly, and by using the inverse square law, it is possible to work out the new exposure

directly. Before moving the enlarger head, measure the distance from the enlarger lens to the baseboard. Move the head so that the new print size is framed in the baseboard, and then measure again the distance from the enlarger lens to the baseboard. The necessary increase in exposure is the square of the change in height of the enlarger head. For example, if the initial height of the head is 40 cm, and it is raised to 60 cm, the change in height is $60/40$ which is equal to 1.5. The change in exposure is the square of 1.5, which is 2.25. A

factor of two is one stop, so just over a stop extra exposure is needed. When odd changes in print size crop up, it is easy to use a pocket calculator to work out the exposure changes.

The inverse square law is useful if you ever have occasion to use a lens on a bellows, where the change in magnification is linked to the change in exposure. When a lens is focused on infinity, its distance from the film is equal to its focal length, and for most subjects it is not necessary to move it much farther from the film. To form an image on the film that is the same size as the subject, though, the lens must be moved out twice as far—two focal lengths—and the light intensity is only a quarter of what it is for distant subjects. So two stops extra exposure are needed when the image is life size.

The inverse square law also easily allows you to work out the light falloff at different distances from a flashgun. In the example given at the beginning, it would help you to decide whether the difference in exposure between the closest and most distant figure was acceptable or not.

Light falloff Each time the distance between the subject and light source is doubled, the intensity is cut to a quarter. Illumination at four times the distance is $1/16$



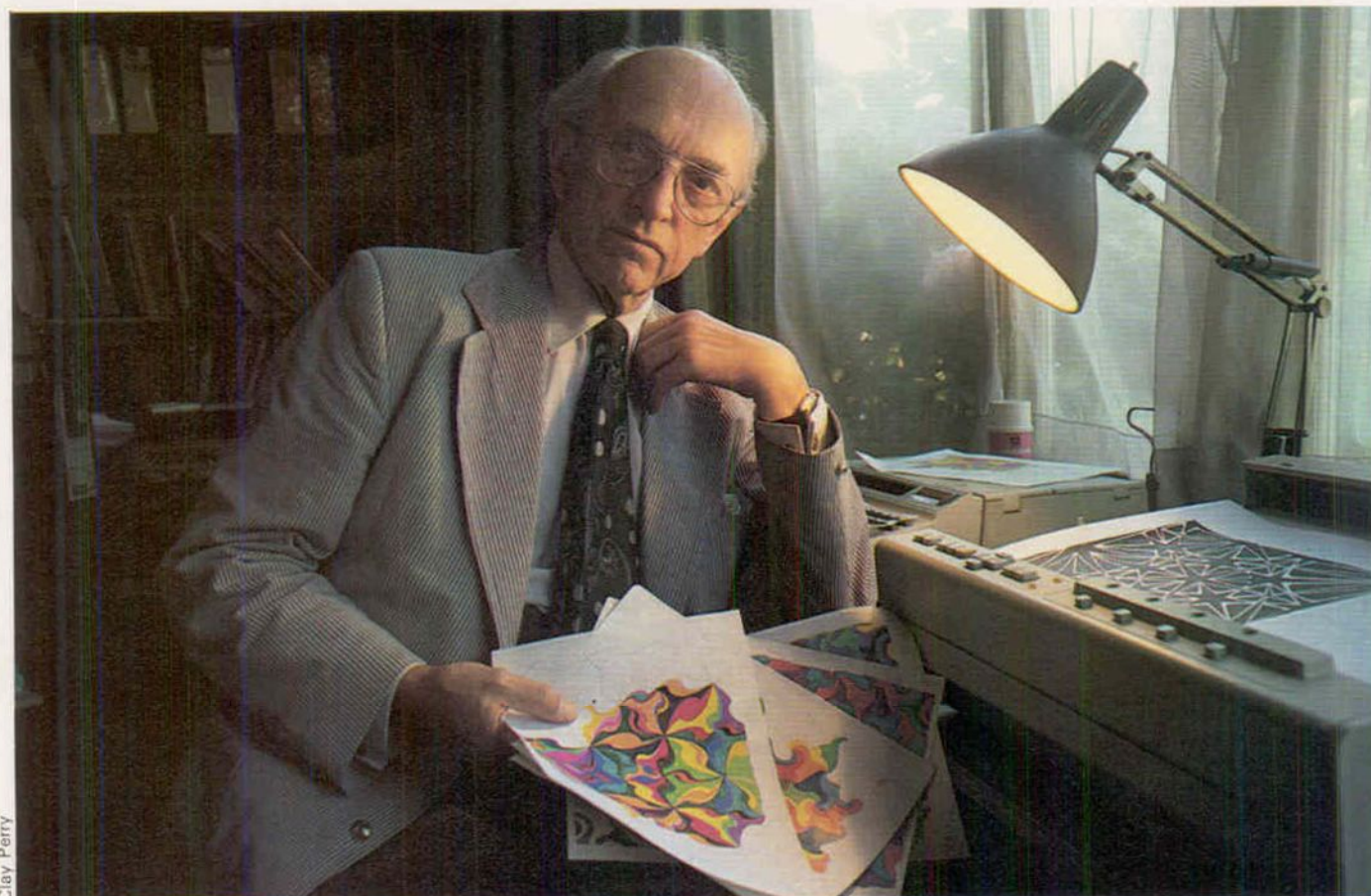
Paul Webb



Improve your technique

Available light indoors

Coping with the existing light you find indoors causes problems for many photographers. Knowing how to deal with different lighting types will solve most of the problems



Clay Perry

The available light you find indoors cannot be controlled in the way that flashguns and other lighting equipment can and calls for the use of different techniques. Without being able to alter the strength, direction or nature of the light being used, the photographer has to learn to make best use of what is already there.

Available light, sometimes called existing light, refers to the normal lighting which you find in a room. In daylight, this would mean the natural light coming through the windows and perhaps supplemented with some artificial lighting. It may also mean a small amount of daylight with artificial light as the main illumination. At night, the available light will consist solely of artificial lighting although this itself may

consist of a mixture of different types such as tungsten bulbs and fluorescent tubes.

Many people think that taking photographs indoors without special lighting equipment inevitably leads to poor results. This should not be the case and, although there are problems coping with the variations of available light, the results are usually more natural than the harsh effects often created by a flashgun.

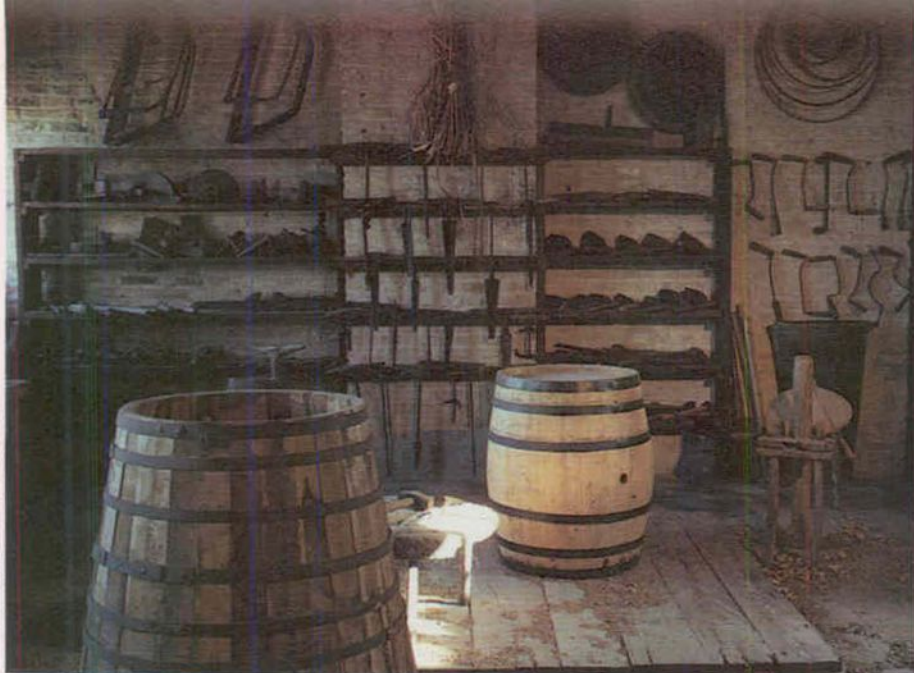
Contrast problems

One of the difficulties associated with using available light indoors is the inherent contrast of the light source itself. This is usually daylight coming through a window which produces hard side light, but it can also be domestic lamps. Daylight outside, on the other

Mixed lighting *Deliberately adding a tungsten light to the window light has produced a more atmospheric portrait*

hand, is always much more soft because of the influence of skylight and the effect of clouds, nearby buildings and walls.

Exposures indoors will normally be rather long with slow or medium speed films so that, on the whole, it makes more sense to use fast films such as Tri-X or HP5 (400 ASA/ISO) for black and white. For colour transparencies use films such as Ektachrome ET 160 for tungsten light, and Ektachrome ED 200 if either daylight or flash is the main light source. These higher speed films will allow you to use shorter exposures to freeze movement or increase depth of field. Fast films are inherently less contrasty than slower



Natural light *The mood created by natural light can influence the whole shot. A tripod is needed in low light*

ones and this has the advantage of helping to counter the problem of increased contrast indoors.

One further advantage of using fast films is that they can be *uprated*. Most black and white and colour transparency film with speeds of 400 ASA can be uprated to 1600 ASA quite safely where it would have been either impossible or inconvenient to use the film at its recommended speed. Suppose, for instance, your exposure meter gave a reading of 1/8 second at *f*/2 for a shot indoors at 400 ASA. By uprating the film to 1600 ASA you could use 1/30 second at *f*/2 which would allow you to hand hold the camera whereas with the former setting you would have to use a tripod to eliminate camera shake. Do not forget that if you uprate films an adjustment in the processing will have to be made.

Unless the room in which you are shooting is white or lightly coloured, the lighting contrast is likely to be very great. For this reason it is important to position the subject carefully in relation to the light source. There will probably be several stops difference between the highlight areas adjacent to the light source and the shadow areas in the background. This calls for very accurate and intelligent use of the exposure meter. It is usually better to take light readings off the relevant portion of the main subject. If necessary you can use a reflector, which need be nothing more elaborate than a piece of white card, paper or sheet to fill in shadow detail. Obviously large areas to be filled in will need either a large reflector or an additional light source.

It is very important to realize that low levels of illumination, such as from a 80

watt bulb, do not necessarily mean soft light. On the contrary, most domestic lighting is very contrasty because its position high up on the wall or ceiling throws big, harsh shadows.

Assessing lighting contrast and deciding whether what you see through the viewfinder of your camera will actually be recorded by the film is perhaps the single most important aspect of photography. Modern film, whether colour or black and white, is unable to cope with the same brightness or contrast range as the human eye. This means that what your eye sees in a particular scene will not necessarily be recorded in its entirety on the final negative or transparency. There is a very simple trick which artists have traditionally used to evaluate the shape and contrast of their subjects.

This is to squint at your subject—to close your eyes so that you can just see a dim outline of the scene in front of you. Note that the shadow and highlight areas which contain detail with your eyes fully open now no longer register. The film will react in a very similar fashion.

Once you get used to using this discipline every time you view a difficult shot you will avoid disappointing results where what you saw in the first place does not appear in the photograph.

There are occasions, particularly with architectural interiors, when you want not only to record detail in the deep shadow areas but also to highlight detail such as bright daylight streaming through a window. With normal average exposure readings and film development, only the mid tone areas will record any significant detail. The highlights will be burned out while the shadow areas will go black. There is not much to be done in this kind of situation with colour materials, short of using supplementary fill-in lighting. But with black and white film over which you have development control you can 'compress' the tonal range of the film. The secret is to expose for the shadows and develop for the highlights. Normally this technique is used with large format cameras where single sheets of film can be exposed and developed individually to give the exact effect required but there is no reason why the same technique cannot be applied to 35 mm format, as long as you treat the rest of the film this way.

Using window light

To get used to available light, begin by taking portraits or simple still life arrangements just using the daylight coming through a window. A variety of



Martyn Adelman

Railway coach *Although these tungsten lamps have made the colours artificially warm, this shot is still attractive*

effects can be treated in this way by moving your subject experimentally in relation to the window light. You can light from the front by positioning your subject face-on to the window and taking the photograph from outside facing in. Alternatively, use sidelighting so that half the face is brightly lit while the other side is in deep shadow. A silhouette can be achieved by shooting directly into the window with your subject facing you. The variations are endless, especially if you use a white reflector to fill in the shadow detail.

Watch very carefully for background detail such as bookshelves and standard lamps interfering with your subject; because of the great difference in contrast between the foreground and background you may not be aware of obtrusive detail. Exposure readings also have to be very carefully evaluated in view of the enormous range of brightness levels.

Even with fast film, when you are using available daylight indoors, you will usually have to use fairly slow shutter speeds—1/60 or slower—if your aperture is to be anything but wide



George Wright

Blacksmith In pictures like this the light itself is the strongest point. A flashgun would have spoiled the mood

open. To avoid camera shake, especially with longer focal length lenses, you will need to support the camera in some way. A sturdy tripod is ideal but a table top with a pile of books for final height adjustment will suffice with care. A tripod is also a very useful disciplining element in that it makes you much more decisive about the framing and positioning of your final shot. Full details on keeping the camera steady are covered on pages 154 to 157.

Colour temperature

The quality of daylight varies considerably according to the time of day and the season of the year. Winter sunlight, where the sun is low and casts long shadows, is entirely different from summer sunlight, where the sun is high in the sky and casts short shadows.

This clearly makes a considerable difference to the amount of light available. While the winter sun is generally weaker, it may actually illuminate a south facing room more because more direct light comes through the window.

The colour temperature of daylight also varies according to the time of day and prevailing weather conditions. An obvious instance is red sunset light compared to the bluishness of a cloudy, rainy day. Although it is fairly easy to assess the quality and colour temperature of daylight outdoors, it becomes more difficult indoors since there are other factors which influence it. The colour of walls, floors, carpets and curtains can influence the final colour of the film. Windows themselves can diffuse light or concentrate it depending on the angle of light and the optical quality of the glass.

Shooting with black and white material obviously eliminates many of these problems since there is no colour to worry about—the main factor, apart



Clay Perry

Finnish gypsies The warm tones in this shot are caused by an overhead tungsten bulb which supplemented the daylight



Timothy Boddow

Inside looking out *The interior need not be correctly exposed as long as there is enough detail shown to hold the interest*

from composition and lighting, is being able to cope with contrast.

Apart from daylight, which is the commonest photographic light source there are other manmade light sources which are used indoors when there is little or no daylight to make short enough exposures.

Daylight is a general term describing mean noon sunlight plus skylight. But as mentioned, it can vary in its colour temperature. Mean noon sunlight contains equal quantities of blue, green and red light—the primary colours which, mixed together, produce what we see as white light. Electronic flash and blue flashbulbs also have the same colour temperature as daylight. This is a great advantage when shooting in colour since flash can be used with daylight type colour slide film.

The tungsten lights used indoors are deficient in blue so that photographs taken using daylight type colour film will have a warm reddish colour cast. To combat this problem colour reversal films are made in two types—one for daylight and one specially for tungsten lighting. Tungsten balanced colour transparency films, because of their

chemical make up which compensates for the lack of blue in artificial light, will produce a blue colour cast if they are used with daylight or flash.

Fluorescent light is something of an unknown quantity as a photographic light source since the colour temperature emitted by a fluorescent tube depends entirely on the type of tube being used. There are at least seven types in general domestic and industrial use—all of which emit different colour compositions. This

light is very difficult to cope with and since it is so varied, there is no film made to match it. It usually gives colour transparencies a greenish cast but it can also cause blue or red casts. The colour bias depends entirely on the type of tubes used.

Mixed lighting

Since different light sources emit various colour temperatures, it is highly probable that if you take pictures by available light you will encounter one of the photographer's nightmares—mixed lighting. When taking a simple shot of a living room and kitchen interior, for example, you are likely to have a mixture of daylight, tungsten and fluorescent lighting, all of which would produce different colour casts.

What you have to establish before all else is the dominant light source. This can be done by roughly assessing the lighting ratio by eye. Turn the artificial lights off and stand back to see what difference this makes to the shadow detail if there is a lot of daylight streaming through the doors or windows. Alternatively, use an exposure meter to measure the relative brightness. Do this by taking a reading from the areas lit by daylight and another from the tungsten lit areas. Use the appropriate colour film for the light source which is strongest.

If the room in which you are photographing has a fairly equal mix of daylight and tungsten light the decision is



John Sims

Chair Shafts of sunlight *can be a useful light source indoors even if they do not fill the whole room*

Joseph Visti/fotogram



more difficult. If you use daylight type colour film to record the daylight parts of the picture accurately, the tungsten lit portions will have a warm reddish cast over them. If on the other hand you decide to use tungsten type film then the daylight portions of the pictures will go cold and bluish. Pictures with a warmish cast are generally far more acceptable than ones with a cold bluish cast so that it is usual, if in any real doubt as to what film to use, to shoot with daylight type colour film.

When you run into problems with mixed lighting, try and increase one single source of lighting to produce a more dominant type of light. This will help you to decide which film to use and you may find that all you have to do is open the curtains more fully or add an extra reading lamp or reflector.

Conversion filters

Another method of balancing colour film to different light sources is to use various colour conversion filters over the camera lens.

Two of the most useful filters are those numbered 80A and 85B. The 80A is a blue filter for exposing daylight colour film in tungsten illumination. The 85B is an amber filter which is used for exposing tungsten balanced film in daylight. Both of these filters cut down the amount of light reaching the film and you need to increase the exposure by 2 stops for the 80A and about 2/3 stops for the 85B.

Compensating for fluorescent lighting is slightly harder. If the fluorescent light is fairly weak you may find that the warmth of the tungsten lighting will eliminate its influence. With stronger fluorescent lighting, however, the colour cast is so obvious that more careful correction is needed.

Some manufacturers now produce filters which are designed to adapt ordinary daylight film for use with fluorescent lighting. FL-D filters are designed to cope with daylight-type fluorescent tubes while FL-W filters are

for use with white or warm tubes. These filters can produce good results, but to get the best correction possible you have to choose a specific filter, or pair of filters, to compensate for a particular type of tube. But, because tubes are replaced occasionally, a single room may have more than one type of tube. This problem is difficult to solve and is the subject of a separate article.

Once you become aware of the effects different types of lights have on your subject you can juggle around with them to produce very creative shots. The most striking pictures are almost always those taken with very simple lighting—wonders can be done with nothing more elaborate than an Anglepoise lamp and a piece of white card. Look carefully at your subject. Squint at it to evaluate the broad tonal areas. And, above all, experiment with different film, lighting and positioning.

Still life Backlighting from a window can be used effectively for a wide range of still life shots

Cat and rabbit A window gives a diffuse and natural illumination which can be ideal lighting for portraits



Clay Perry



Creative approach

Spring

For most people, spring is a time for new green shoots, delicate flowers and new lives; a time for young lovers, poetry and spring cleaning; but it is also a surprisingly good time of year for photography

After the long gloom of winter, the coming of brighter weather signals the arrival of spring and the promise of better conditions for photography. You can go out with your camera confident that even if there is not quite enough light at the time for the type of shot you want, there soon will be. Indeed, daylight in spring has a particular quality that many photographers feel make it the best time of all for outdoor pictures.

But the change in the weather brings a whole host of other changes—to the landscape, to our daily routine and even to the clothes we wear—which all contribute to the aura associated with spring. Traditional springtime subjects like wildflowers and spring lambs

obviously make very attractive themes for photographs, but spring offers many less obvious photogenic possibilities for those prepared to look for them.

Spring light

For the photographer, the most important single quality of spring light is simply that there is more of it. The sun is higher in the sky than in winter, it is visible more often and there are more daylight hours available.

Although some subjects look better in gloom, most benefit from the stronger light. First of all, the photographer has greater control over exposure settings and can select particular shutter speeds or apertures for creative effects much

more easily than in winter.

More importantly, though, the extra light affects colour and contrast in the landscape. Colours become brighter and fuller than they were in winter, and the range of contrast is generally greater—though this varies considerably from day to day according to the weather.

By summer, at the other extreme, the light tends to be just a little too strong. On a really bright summer's day, you may not be able to open the aperture

Magnolia *It is tempting to fill the frame with blossom, but a few isolated blooms can be more effective when contrasted against a pale blue sky*



Tania Midgley/Vision International

right up for differential focusing or use a low shutter speed to blur movement without overexposing the film. Similarly, colours tend to become washed out and flat and changes in vegetation exaggerate this effect.

Take advantage of the spring light while it lasts for all kinds of photographs that do not depend on extreme weather conditions for effect.

If you want to photograph buildings, for instance, now is the time to do it. There is plenty of light to reveal all the fine architectural detail and the sun has not yet climbed high enough to cast deep, distracting shadows everywhere.

From a photographic point of view, your house probably looks better in spring than at any other time of year. If you want to take a picture of where you live, it is often worth looking around for a tree to provide foreground interest and shoot through the branches; the trees are newly leaved and will not obscure much of the view behind. It is surprising what a difference a little delicate foliage can make to the scene—even the grimmest tower block can look quite attractive.

Outdoor portraits will also benefit from the brighter, but not yet harsh and unflattering, light that comes with spring. So too will landscapes, though in this case natural changes contribute as much to the feel of the picture as the light. The one limitation is the weather.

Changing weather

In Europe and many other parts of the world, spring is marked by changeable weather. It can be raining one minute, snowing the next and then suddenly the sky will clear and the sun will burst through. The rapidly changing weather provides some wonderful photographic

Ewe and lamb *In sheep country, spring means lambing time. Move in as close as you can without frightening the sheep and try using the ewe to frame the lamb*



Robert Harding Associates

Rain drops on the window. *In the bright weather after a spring shower, wet surfaces and rain splashed windows sparkle like jewels*

opportunities nonetheless.

On a typical showery day, the sun often comes out rapidly after a cloud-burst. As the sun catches the wet surfaces, they shine and sparkle and the air seems startlingly clear. All the colours in the landscape seem to positively glow. Wherever you are,



Julian Calder



Eric Crichton/Bruce Coleman Ltd

Red tulips *Tulips are an obvious subject, but shots of bulb fields can be dull and it is worth concentrating on a few blooms of the same colour*

whether in the town or in the country, these moments just after a shower are worth waiting for. Even the most mundane scene looks full of life and colour in these conditions.

Look for all these bright reflected highlights—shiny pavements, wet leaves, wet paintwork—and include them in your shot. But beware of overdoing it; too many highlights can give a horribly confused image. It is better to select a few and concentrate on them. A row of wet slate roofs in a grey urban environment, for instance, can look good in both monochrome and colour. A generally dull scene will complement the highlights.

Whatever you include in the frame, make the most of the reflected sunlight. Generally, this means shooting towards the sun so that the reflection is not a burnt out image of the sun but a brilliant though diffuse patch of light. Sometimes it is worth shooting directly into the sun, but usually it is better to shoot at a shallow angle so that the sun is just excluded from the frame. This means that the reflection remains the focus of the picture and you retain plenty of shadow detail—provided you get the exposure right (see page 32).



John Sims/Vision International

In the brilliant sunshine after showers, look not only for reflections but also bright colours. Paintwork in particular comes up well and a row of brightly painted houses or window frames, or even just a wooden fence, will look their best in these conditions. Close-ups of peeling paintwork can work particularly well. But try to avoid overwhelming the picture with too many colours—just a small splash of bright red or vivid blue will jump out of the frame.

Quite often one area of the sky remains heavy with grey clouds even after the sun has come out. Move round and use this as a background for a brightly coloured foreground object. The brilliantly lit subject should stand out spectacularly from the lowering sky—red works particularly well. Since even the grey clouds reflect light from the sun the whole scene can appear luminous and almost surreal on film.

These sort of conditions are ideal for photographing your car. Even the most



Adam Woolfitt

Snowdrops *Among the earliest of all spring flowers is the snowdrop, pictured here emerging from melting snow which nicely sets off the fresh green stalks*

Furrowed field *When you are out in farming land, look for all the changes that happen in spring—new shoots in the fields for example and seed planting*

Edouard Berne/fotogram



worn car looks glossy and new, providing you catch it before the water evaporates. Dawn is the only other time that produces equally good light for this type of shot.

As the clouds begin to break up and the illumination becomes more even, you may find conditions ideal for landscapes. The scenery remains clearly defined, the colours are still fresh and bright and a blue sky may still be full of scudding clouds.

Snow melting

If you live in or near a mountain region, one of the most significant changes that take place in spring is the melting of snow that has lain in the hills all winter. The melting snow fills local rivers and may cause extensive flooding.

Flooding can make attractive pictures but usually their interest is only documentary. The rivers themselves, however, often look most impressive when swollen by spring meltwater, particularly in the upper reaches. It is worth walking up into the hills on a fine spring day. The sparkling rapids and waterfalls are at their best, and you can take dramatic monochrome pictures of raging mountain torrents as the grey

clouds roll in before another shower.

The melting snow itself can be very photogenic. Try catching droplets of water in the sunlight as the melting snow drips off a grassy tussock or the branches of a pine tree. But perhaps it is the changes that are wrought by spring on plants, animals and, of course, people that offer the most opportunities for the photographer.



Tree in bloom *Immediately before and after a shower, the colours of a subject caught by the sun glow against the lowering sky*

Wildflowers and woodlands

Everyone knows how pretty are spring flowers and dewy leaves and blossom on the trees, but very few people manage to capture them on film successfully. They seem so attractive that it is tempting to simply point the camera in the right direction and shoot—the subject should do the rest. But without careful framing and choice of conditions, results can be disappointing.

The appeal of spring wildlife lies in fresh, bright colours. Modern colour film can render the most subtle hues accurately, but to capture the freshness, choose your moment and viewpoint carefully.

Spring flowers, for instance, seem very obviously photogenic, but they need the right treatment to produce anything but a dull picture. Daffodils, or any other spring flowers, in the park look beautiful in real life, but without the warm spring air, the scent of fresh vegetation and the gentle sounds to create the atmosphere of the scene, daffodils in photographs can make an uninteresting mass of green and yellow.

Just as with any other subject, you need to be selective. Either concentrate on one or two blooms and try to capture their delicate form and colour,

Trevor Wood

Carpet of blossom *An unusual shot that takes advantage of the delicate spring colours for an interesting abstract photograph*

Crocuses Look for small sprays of wildflowers growing in unusual places where the rough texture of wood or stone brings out their delicate beauty

or stand right back and frame the whole bed as a bright yellow shape. Alternatively, flowers can provide an attractive foreground for shots of people or buildings—a low viewpoint (just above bloom height) can be particularly effective.

If you concentrate on a few blooms, the form of the flowers is very important. You should try to find the viewpoint and lighting conditions that bring this out to best effect. A high viewpoint, for instance, is rarely effective because the head of the daffodil turns over and looks least interesting from above. A high viewpoint also makes it difficult to separate the bloom from its background—the ground is too close to be thrown out of focus. It is usually better to get down on the ground and photograph the flower from its own height, or even lower. So remember to take something waterproof to kneel on, especially since one of the best times to take your picture is shortly after a shower when droplets of water are hanging on the petals—and on the grass!

Like a high viewpoint, high angle sunlight rarely brings out the form of the flower very well and it is probably better to get your pictures either fairly early in the day or fairly late. Low angle sunlight helps to show up the delicate

texture and shape of the flower head. Strong sidelighting, though, may produce shadows that are too harsh and the best results are usually produced by oblique frontal lighting or backlighting. With frontal lighting, though, it is worth underexposing by half a stop or so to retain the full colour of the blooms. Backlighting can also present exposure problems, but it can make the flowers glow translucently, giving the picture all the delicacy and fresh brightness traditionally associated with spring.

If you want to photograph the whole

host of daffodils, on the other hand, the form of individual flower heads is unimportant. Choose your viewpoint and the time of day to merge the flowers into a big, bright yellow carpet. The sun should perhaps be higher in the sky than for the single bloom or small cluster, and your viewpoint should also be slightly higher—the farther back you stand the

Spring festival Traditional festivals to celebrate the coming of spring make colourful subjects, but you should move in close to give the colours impact



Robin Fletcher/Vision International



Paolo Koch/Vision International

higher it can be. But unless the picture is to be completely abstract, this type of shot is rarely interesting by itself. Try to include some complementary centre of interest, such as children playing, a couple walking or a tree in leaf.

Although daffodils and tulips are the easiest to find of the spring flowers, it is the small wildflowers that for most people capture the essence of spring. Small clusters of crocuses or primroses can be very photogenic, but again you should choose the conditions carefully. Move in close so that the flowers fill the frame and try to find something that lifts them out from their background. Look for isolated clumps poking out from stonework or woodwork or beside the gnarled roots of an old tree. The contrasting rough texture and the dull neutral tone should help to emphasize the fragility and colour of the petals.

As spring progresses and the trees become thicker with leaves, woodlands become equally photogenic. Shots of avenues of trees with the sun filtering through the new foliage or even of single trees can be very effective if properly exposed.

The dappled sunlight in spring woods and the wildflowers have always seemed ideal settings for pretty shots of young girls in frilly dresses and children at their most innocent, particularly in soft focus, but such pictures have become photographic clichés and need to be approached with caution. Avoid fussy detail in the frame. Steer clear of banks of flowers, for instance, and ask your model to wear plain, simple clothes. As with the small wildflowers, it is worth introducing a rough textured element like a tree or a stone wall to contrast with the general hazy softness.

New life and new paint

Although the effects on nature are most obvious, spring also changes our daily routine. For many people, spring is a time to do their annual cleaning and

repairs. Boat owners might repaint their boats, house owners repaint the outside of their house after the ravages of winter, and car owners do their annual overhaul ready for the summer's touring. All of these activities can provide interesting or amusing subjects for pictures—particularly of friends and family. In some parts of the world, spring cleaning means hanging the floor coverings out the window for airing and a row of windows festooned with brightly coloured carpets can make an attractive picture.

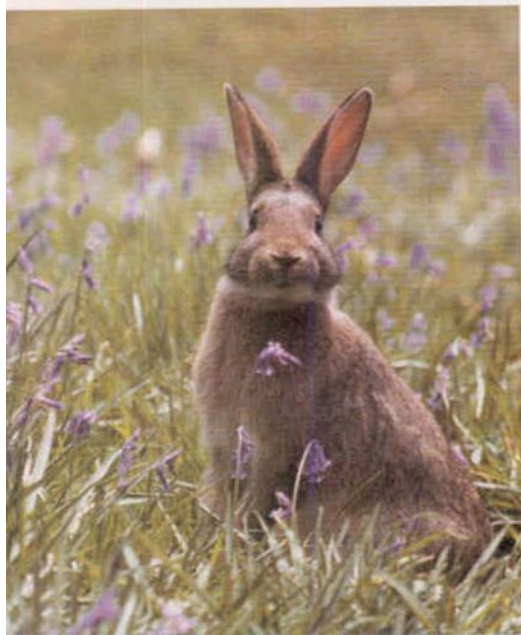
The influence of spring is particularly pronounced in work involving a close association with nature, notably farming. If you are out in the countryside, look at all the changes that are happening in the fields; the planting of seeds, the

Spring in New York Even the most stark looking office block can look attractive in the spring sunshine seen through new green leaves

flowering of certain crops, the blossoming in the orchards. All of these can make beautiful subjects in their own right or contribute to a fascinating record of the farming year. Spring is also a busy lambing time and spring lambs can be exceptionally photogenic. Try to catch them gambolling in the sunshine or framed against their mother. Ask the farmer if he would be willing to let you photograph the moment of birth. If this takes place indoors, remember to load the camera with a fast film.

Spring is essentially what you make it. You could set out to capture all the traditional elements of spring on film, or you can simply make the most of the spring weather for the type of photographs you like to take all the year round.

Rabbit in the bluebells A classic spring shot with wildlife and wild flowers, caught by a photographer with the aid of a telephoto lens



Jane Burton/Bruce Coleman Ltd



Vautier/De Nanxe

Getting better negatives

The recommended processing time does not always give the best results. You may need to change your film developing time to get top quality negatives

make prints that do not contain both a pure black and a pure white—especially for special effects. But most pictures look best if they contain these extremes as well as a full range of intermediate tones of grey.

When you make pictures on black and white film, you usually have two main ways of controlling the negative. You can either vary the initial exposure or you can alter the development time; and these affect the final appearance of your prints to a large extent. But these departures from the recommended guidelines have to be made carefully to avoid spoiling your pictures.

The right development time

The only way to be completely sure that you are developing your film properly is to make prints from your negatives. If you are not satisfied with the black and white prints you are making but are confident about your printing technique, it is likely that your problems are caused by your film exposure and developing methods.

Examine some prints you have made on normal grade paper. Take a close look at the shadows in the pictures. If these are dark, murky, and obviously do not contain sufficient traces of detail, the most probable reason is that you have underexposed or underdeveloped the film. You can tell the difference between underexposure and underdevelopment by looking at the shadow region of the negative.

If the negative is underexposed, there are unlikely to be very many tones corresponding to detail in the shadow regions. If underdevelopment is the problem, there is likely to be faint detail in the shadows. But the real check is to look for a range of distinct tones in the negative—an underexposed negative will yield ample shadow detail but a poor range of tones and prints lack the sparkle you might expect of a properly developed negative.

Persistent underexposure points to faults or inaccuracies in your exposure metering methods. If you find you cannot get to grips with revised methods of taking meter readings, try adjusting the film speed dial to a lower setting so that the meter is fooled into giving the necessary additional exposure. Try setting the meter at 80 ASA (ISO) if you are using 125 ASA film, 250 ASA if you are using 400 ASA—each representing a 2/3 stop drop. Black and white film can take considerable abuse as far as exposure is concerned and it may be that even this change in the exposure setting may yield no improvement, in which case you must consider revising your metering technique. The golden rule is *expose for the shadows, and develop for the highlights when using black and white and colour negative film.*

Underdevelopment can sometimes be corrected by increasing development times slightly. But first check that the cause of underdevelopment is not simply the result of processing films at



John Ward

A negative is only a stepping stone to the final print. If you can produce a good negative, it is most likely that in the final print all the important tones will appear as a realistic or effective reproduction of the original scene. Exposure and development are both critical in forming good negatives, especially if you do your own processing and want the best possible image quality in your photographs.

If you follow the instructions film and developer makers give for their products—and if you are careful about exposure and processing—you should be able to produce good results most of the time.

But manufacturers' instructions cannot be accurate for anything other than average conditions, and so if you find that your results are consistently poorer than expected, it may not be just your technique that is wrong. In fact, variations in your camera, lens, metering system, enlarger, and processing and printing techniques may all

An easily printed negative Just what makes a good negative depends as much on your enlarging technique as on negative exposure and development

combine to produce a set of conditions far from the average.

To be fair, most manufacturers do state that their instructions are intended only as guidelines and you can use these recommendations as the starting point for your own experiments in making worthwhile negatives. This means negatives that print 'straight', with the minimum of shading and burning-in. At the same time, these negatives should have an overall contrast range that matches closely the contrast grade of paper you usually print on.

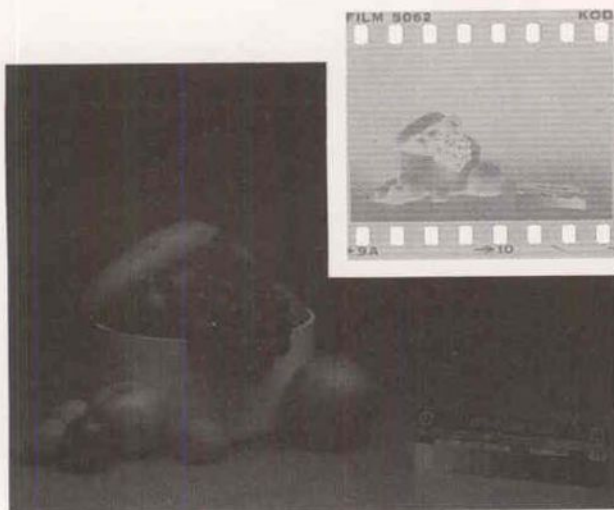
As a general rule, the aim is to make prints in which the shadow areas of the image run to a black which is as deep and rich as possible, and in which the brightest highlights are as light as the base tint (usually white) of unexposed paper. You may sometimes want to

Effects of exposure and development

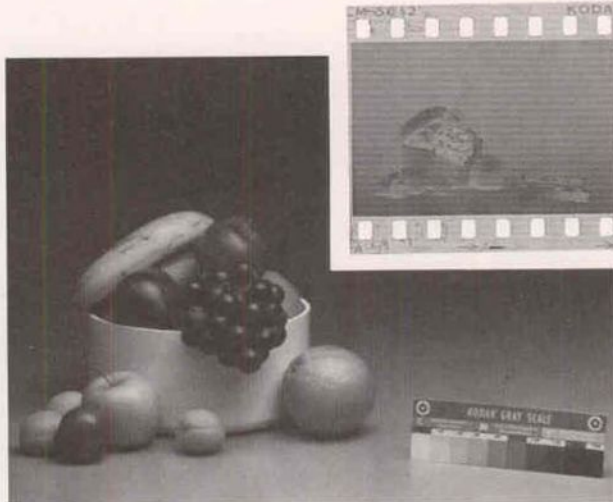
Underexposure

Normal exposure

Underdevelopment

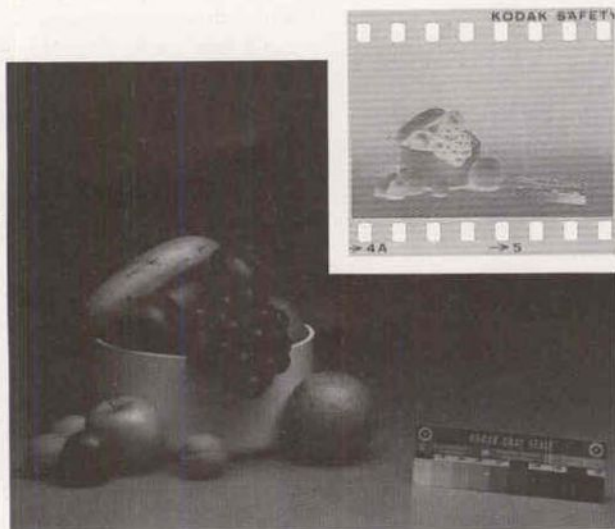


Underexposed and underdeveloped

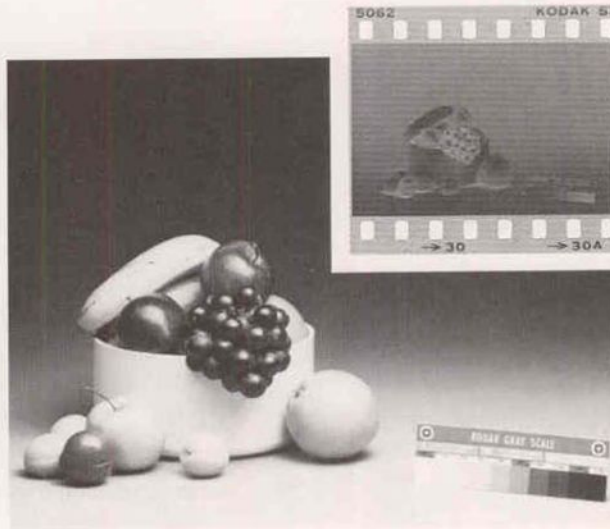


Normally exposed and underdeveloped

Normal development

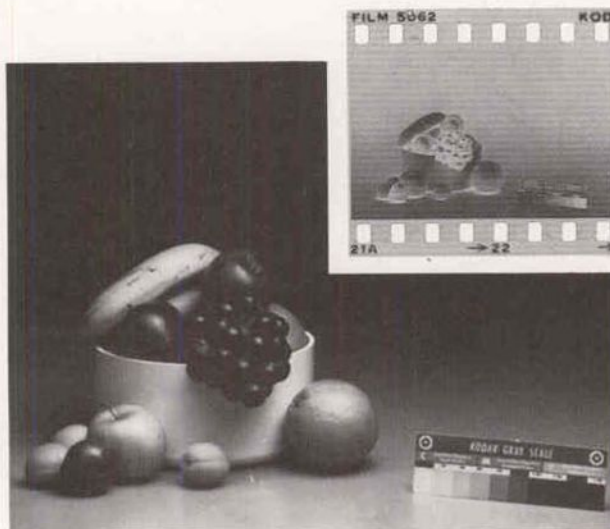


Underexposed and normally developed

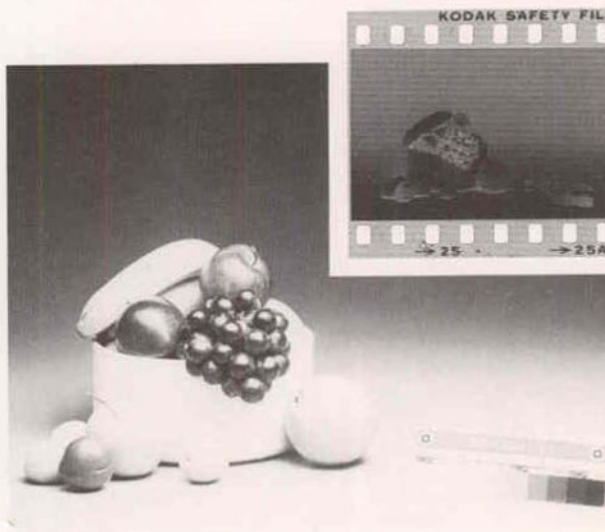


Normally exposed and normally developed

Overdevelopment

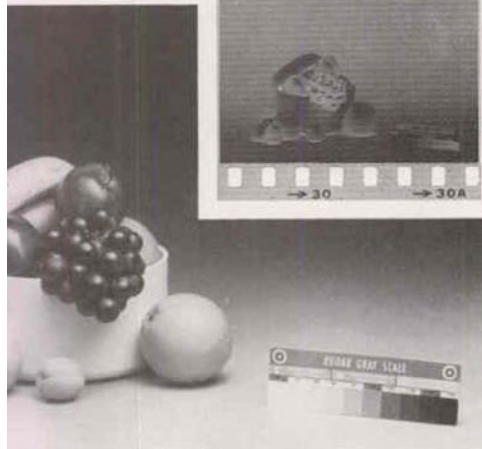


Underexposed and overdeveloped

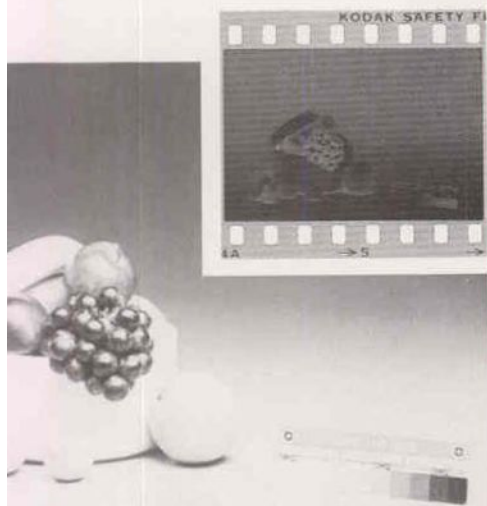


Normally exposed and overdeveloped

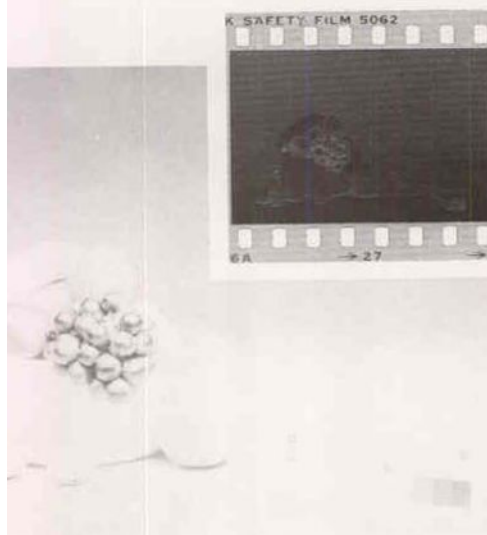
Overexposure



Overexposed and underdeveloped



Overexposed and normally developed



Overexposed and overdeveloped

too low a temperature. Developer temperature can fall to unacceptably low levels during the course of long development times unless suitable precautions (such as a waterbath) are taken. Correct agitation is also important and you should follow the manufacturer's recommendations carefully.

There is also absolutely no point increasing development time in order to try and salvage an image which, because of underexposure, does not exist. Prolonged development can begin to affect silver halide crystals which have not been activated by exposure and the effect of this is that grain clumping is encouraged and the general fog level of the film increases. The result is much increased graininess and too much contrast.

Where detail does exist, you can increase the developing time to enhance detail as well as to increase negative contrast. If, for example, you know you have underexposed a film—perhaps because you have set too high a film speed—at least some detail is likely to record, but normal development will do no more than render this visible. To make sure you get a worthwhile image, increase the development time by 25 per cent, but bear in mind what sort of negatives will be produced. All the unexposed areas will, apart from the slight increase in fog level, remain as clear as they would have under normal development. All areas that have received exposure will show increased density and so contrast strongly with the comparatively clear areas of the film.

Negatives which are overexposed or overdeveloped are dense and difficult to print. You can tell the difference between the two by looking at the frame edges (the film 'rebates') which remain clear if overexposure is the problem. The increase in fog level associated with overdevelopment affects

Exposure and development Known cases of underexposure (left strip of photographs) can be compensated for by increasing development time. The best print yields poor quality highlights here but the overall toning down of contrast can be useful with certain contrasty subjects. The image is more grainy than the best combination, the normally exposed and normally developed photographs in the centre. The normally exposed strip in the middle best shows the effects of development on the contrast of the negative. Contrast is too 'flat' at one extreme and too harsh at the other for what is a typical 'average' range of subject brightnesses. Known overexposure can be compensated for by underdevelopment (right strip, top) but grain size and contrast become objectionable with normal and overexposure. The 'normal' negative suitable for a 'normal' print from a diffuser enlarger would be denser, and similar to the 'normally exposed and overdeveloped' negative in this series

the whole film, and this includes the rebates which are out of the picture.

Overexposure is normally restricted to isolated frames on a length of film. It is difficult to overexpose a whole length unless the film speed control has been improperly set, and it is easy enough to check this point. If the whole length of the film is on the dense side, suspect overdevelopment as the problem. The most probable cause is too long a development time. Other less likely causes include over-enthusiastic agitation, a processing temperature that is too high, or the use of speed-increasing developer to develop film which has not been uprated during exposure.

Contrast control

By adjusting development time, some measure of contrast control is possible over the way an original scene is reproduced at the printing stage. If development is purposely increased, denser areas of the negative build up more rapidly than lighter ones, so changing the relationship between the tones yielded by normal development. A contrast increase obtained in this way may be helpful if you are photographing a low contrast subject and wish to inject a little more sparkle into the final result. Much the same effect can be achieved by printing a normally developed negative on to a more contrasty grade of paper, but significant increases are possible only by increasing development in the first place.

To cut contrast in a subject that was harshly lit, for example, you can reduce development time so the various densities become much less easily distinguishable.

Increasing or decreasing development time tends to have a more marked effect on contrast than actual density and so it is best to go by actual printed results rather than rely on visual inspection of the negative. To start with, keep time adjustments to 10 per cent steps. Any great variation needs compensation at the exposure stage. You will have to give additional exposure if you significantly reduce development, and reduce exposure if you plan to increase development. There are no firm rules on this, but as the basis for your own experiments allow one stop more or less exposure for each 25 per cent adjustment to development time.

Any adjustments you make must be done in a careful, controlled way so you can easily repeat your successes, while avoiding any failures. Establish exposure and development time combinations that suit the majority of your pictures—but remember that adjustments in development time cannot compensate for exposures that are wildly incorrect. And unless you are completely consistent in your processing technique, development time adjustments become less of a tool for controlling contrast and more of a threat to your final pictures.

Lenses and image formation

Although you can take photographs with a pinhole, you need a lens to form really sharp images. Most lenses are made of varied combinations of carefully shaped elements, but all lenses work in the same way



Paul Smith

Vautier/De Nanxé

The very first images were not made by lenses—they were formed by pinholes, centuries before the invention of the lens. The image formed by a pinhole is upside down, and reversed from left to right. This is because light always travels in straight lines, and all the light passes through the pinhole. This makes light rays from an object cross over at the pinhole, so the image is reversed. Each point on the image consists of a blurred image of the pinhole, so the smaller the hole, the sharper the image.

A pinhole is not a very satisfactory image forming device. As it is very small it passes a very small amount of light. Consequently the

image is very dim, and if it is used for photography, exposure times are very long. Although it is possible to take photographs with a pinhole fitted to a camera, such a device is impractical for normal photography.

A lens is a much more satisfactory way of forming an image. It passes much more light than a pinhole, and the image that it forms is much sharper than that formed by a pinhole, which usually gives very diffuse and fuzzy pictures.

Lenses and pinholes form images in quite different ways, although the images formed by each are inverted and reversed. To understand how a lens works, it is important to understand how

Woman in window Although pinhole cameras can form beautiful, atmospheric pictures, they need long exposures, and the images are not very sharp

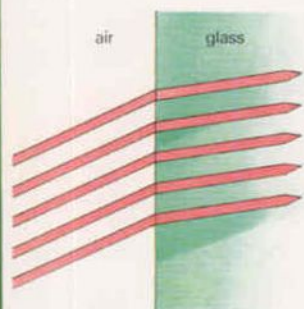
light behaves when it comes into contact with the glass from which a lens is made.

When a beam of light strikes a piece of glass, it immediately slows down, because light travels more slowly in transparent media like glass and water than it does in air. If several parallel beams of light strike a glass

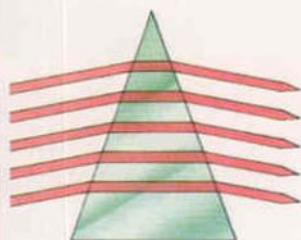
Colour fringing Simple lenses bend blue light more than other colours. This leads to colour fringing called chromatic aberration



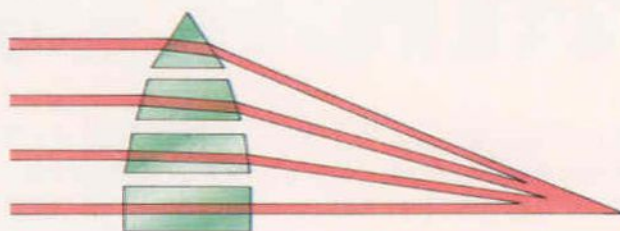
Focusing light



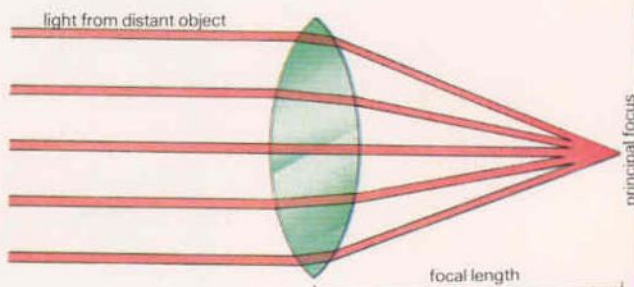
1 Rays of light entering glass are slowed down, so the beam is slewed round



2 A prism bends light once when it enters the glass, and again when it leaves



3 A lens is like a series of prisms. Parallel beams passing through it are bent more at the edges, and pass straight through in the middle. This makes the beams converge to a point on the far side of the lens



4 The point at which beams of light from a distant object converge is called the principal focus, and the distance from it to the lens is the focal length

surface at an angle, the beams that reach the glass first will slow down and deflect. As the other beams reach the glass, they too are deflected. This effect—known as *refraction*—can be more easily understood by comparing it to the way a tracked vehicle such as a tank is steered—when both tracks of the tank are moving at the same speed the tank travels in a straight line, but when one of the tracks is slowed down, the tank will turn in the direction of the slower track.

In a similar way, a beam of light entering a block of glass is turned at an angle when it moves into the denser medium.

If the glass block is prism shaped, the light will be bent round still further when it leaves the glass. This is because the amount of bending is proportional to the wavelength of the light—that is to say, its colour. Some colours of light will be bent more than others, and the prism will spread the light out into a rainbow.

To understand how a lens brings light to a focus, we can think of it as being made up of a series of prisms, each with

a different slope angle. The prisms at the edge of the lens have a very low profile, and bend the light a lot. Those at the middle of the lens have parallel sides, and light from a distant source passes straight through the centre of the lens without being bent. So edge rays are bent a lot, the ones in the middle not at all—and all the beams meet at one point where they are brought to a focus. When the light comes from infinity, the beams hitting the lens will be parallel, and they will converge on the other side of the lens at a point called the *principal focus*. The distance from the lens to the principal focus is called the *focal length*, and this is the most important feature of the lens.

The focal length of a lens is familiar to anybody who, as a child, has burnt holes in a piece of paper by focusing an image of the sun. To get a sharper image of the sun (and burn the hole quicker) the best place to hold the paper is at a distance from the lens equal to its focal length.

Blue light is refracted—bent—to a greater extent than red light. This means that in

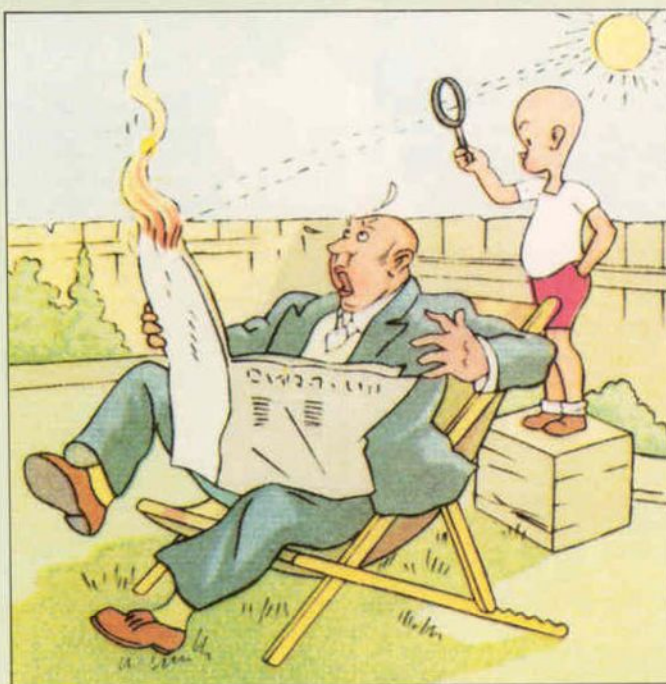
a simple lens, blue light and red light come to a focus at different points. This is called *chromatic aberration*, and can be clearly seen when you look through cheap binoculars—everything is surrounded by rainbows. This effect is undesirable in photographic lenses, and lens designers go to great lengths

to eliminate it.

Only very simple cameras use lenses which consist of one piece of glass. Most camera lenses—in fact all lenses for 35 mm cameras—are made up of several individual pieces of glass. Each one is a lens in its own right, but when used in groups together with other lenses, each individual lens is called an *element*. Some zoom lenses have as many as 16 elements. The reason for this complicated method of construction is that a simple lens does not form a very satisfactory image unless only the centre portion of the lens is used. This method is used in the lenses of old fashioned box cameras, which had a small aperture or stop to reduce the effective diameter.

No lens gives its best results when the whole area of the lens is used. This is as true for sophisticated lenses as it is for simple single element ones. By using the iris diaphragm to close down the lens to a smaller aperture, only the rays of light which are bent a little when passing through the lens are used to form the image. These rays form a sharper picture, so it is a good idea to avoid using a lens at full aperture.

Burning holes To form a sharp image of a distant object, like the sun, a lens must be held one focal length away from the surface on which the image is formed



Picture by courtesy of Gallahers Ltd



World of photography

Operation Drake

In 1978 the 'Eye of the Wind' set sail for a two year voyage around the world. For the ship's photographers it was a chance of a lifetime. But they were to run into problems undreamt of at home . . .



Rupert Ridgeway

Driving salt spray on a sailing ship in a gale; drenching night time dew and relentless equatorial sun; the mud, filth and humidity of a steaming jungle swamp; and climbing thirty metres into the sweaty heat of a tropical rain forest to record scientists at work. These are some of the many hardships that the photographers of Operation Drake had to cope with during the two years of an exciting voyage round the world.

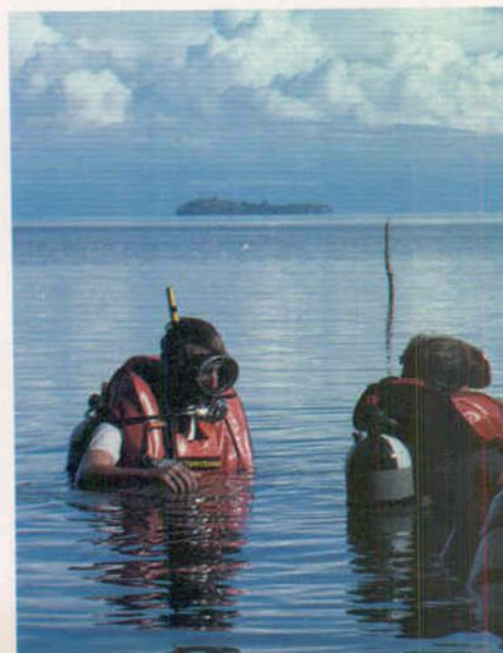
The expedition was conceived and designed by its leader Lt. Col. John Blashford-Snell and the Scientific Exploration Society in London in order to give young people a chance to participate in a number of exploratory, scientific and voluntary aid projects around the world. Planned around the voyage of 150 tonne brigantine *The Eye of the Wind*, the project was designed to mark the 400th anniversary of Sir Francis Drake's circumnavigation in the galleon *Golden Hind*.

But while Drake, Queen Elizabeth's

'master thief of the unknown world', set out to plunder treasure, Operation Drake sailed with the backing of both individual sponsors and international and governmental bodies to assist in conservation programmes, comparative ecology studies, archaeological digs, medical research and marine pollution experiments.

Bound for projects in Panama, Papua New Guinea, Indonesia and Kenya, *Eye of the Wind* sailed from Plymouth in the United Kingdom in November 1978 with its first group of scientists and young explorers. A total of some 2000 people were involved in the two year project, including the back up team who stayed in the UK, innumerable helpers in the host countries, many specialists and 350 young explorers from 27 nations. The young explorers, all between the ages of 17 and 24 were chosen out of 60,000 applicants for their 'positive attitude to adversity' among other attributes. A new team of young explorers joined the ship at each of the

Eyeful *The Eye of the Wind looks majestic against a glorious tropical sunset. Taken from the Vesuvius Reef where Drake ran aground*



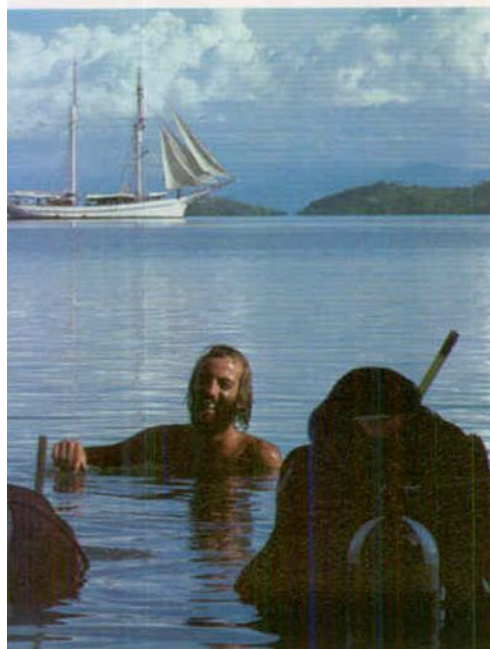


On the boom 'Tiger' and 'Spider' preparing the sail on the course yardarm in the middle of the Atlantic. The picture was taken with a Praktica EE2

nine phases of the journey, replacing the former group who then returned to their own countries.

A good collection of photographs was vital to the expedition for a number of reasons. First of all photographs provided a valuable record for the scientists, naturalists and archaeologists involved in the expedition. Naturalists needed photographs of the rare plants, animals and birds seen during the voyage while the archaeologists took pictures to show every stage of their excavations and to make a detailed record of their discoveries.

Sub aqua Robbie Williamson trains young explorers to dive in Ranu Bay, Sulawesi. The Eye of the Wind can be seen in the background



Less obviously, they needed a constant supply of pictures showing the expedition's many activities to send back to their sponsors for use as publicity shots.

Chris Sainsbury was Blashford-Snell's personal assistant before and during the expedition and coordinated the photographic activities of the expedition. 'We originally thought that we could survive on the photographs taken by expedition members', he recalls, 'but we soon found that they often did not take enough publicity pictures.'

Sainsbury made sure that at least one member of every project was equipped with a camera and primed to take the necessary photographs, but he was the only photographer to be with the expedition for the entire two years. There were also two professional freelance photographers who flew out to the ship to cover two major ports-of-call on the expedition's itinerary. Rupert Ridgway flew to Indonesia to join the expedition for their four month's stay in the area, and Richard Davis covered the three month stay in Kenya.

Chris Sainsbury's first concern was to find out the types of equipment, accessories and film stock that would best fulfil the varied needs of the expedition. There are over a dozen different SLR systems comprehensive enough to cope with most needs, but an expedition like Operation Drake with its heavy commitment to scientific research makes exceptional demands on equipment.

'Just over a week before I left England, with most of my problems still unsolved, a lucky phone call put me in touch with Carl Zeiss Scientific. They were interest-

ed, and capable of solving every problem that I could come up with. The whole project became as much of a challenge to them as it had to me.'

Zeiss supplied a large number of Praktica EE2 cameras, GAF slide projectors, Elmo 16 mm cine cameras and cine projectors. The complete range of accessories they supplied also included Pentacon and Sigma lenses, a complete range of Sunpak flashguns, and all the ancillary equipment like bellows and microscope attachments.

The high powered microscopes enabled plankton samples to be recorded before they died and lost their true form and colour. Remote sensors triggering a number of flash units simultaneously made it possible to photograph bats in flight in the depths of the Indonesian jungle and were invaluable for photographing in large caves. The botanists and other scientists found the Sunpak ring flash units indispensable. Sainsbury also discovered how the difficult lighting conditions of the jungle could be overcome by using a simple compact unit to provide fill-in flash.

Panama was perhaps the most daunting place for the photographers. 'One of the vilest climates in the world,' said an Operation Drake report, and Sainsbury agrees that they faced the most destructive conditions, working in temperatures of 40°C with humidity at over 90 per cent.

'We spent three months in the jungle and every single person who took an

Wreck Two of the diving team identify one of many airplanes wrecked during World War 2. A Nikonos underwater camera was used for this shot





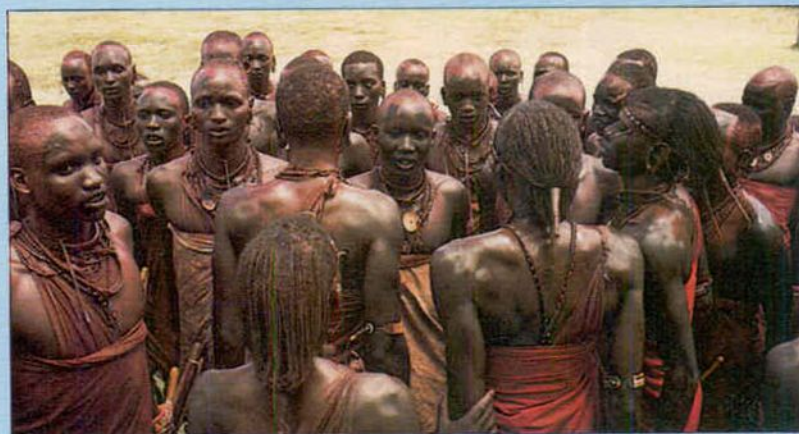
Camel ride Early morning shot of pack camels being prepared for a trek in northern Kenya which followed the route of one of the early explorers

Masai Special permission was given to shoot the Masai war dance. The same photographer had spears thrown at him photographing another Masai tribe

electronic type camera had problems. We could not really take any precautions to prevent humidity affecting the cameras.

'All we could expect was to get through an awful lot of equipment. And that's what happened. The electricians were affected, batteries did not last any time at all and lenses got completely filled with fungus, sometimes within a week of arriving from England.' The other danger there, as in many of the other areas they visited, was excessive heat. After only a few hours in the hot sun some of the cemented lens elements melted and the film emulsion softened and stuck in the take up spool. It was essential to keep the equipment as cool and dry as possible.

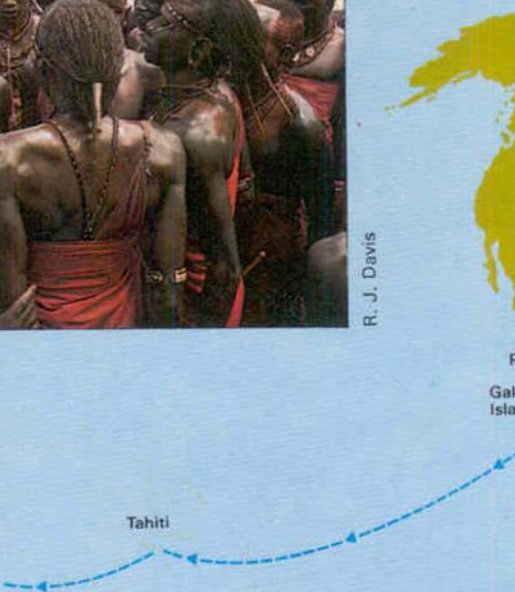
In all the land based phases of the



R. J. Davis

trip a continuous procession of equipment went backwards and forwards from the base camps to the suppliers for cleaning and replacement. Scientific base camps were set up while other groups set off on scientific or archaeological expeditions, and some went on exploratory treks.

The rain forest team studied and photographed flora and fauna from jungle walkways erected 50 metres up in the forest canopy, sleeping in hammocks



and eating army rations or local delicacies like curried monitor lizard for supper.

Bad weather, poor visibility and shark infested waters hampered the diving team, but they emerged triumphant after discovering a Scottish ship that caught fire and sank in the 17th century after one of the crew dropped his lantern in the hold and ignited a barrel of brandy. For their underwater photography the divers used either Nikonos underwater cameras or special waterproof camera bags together with Sunpak underwater flash bags.

Neither party could carry much equipment as they were restricted to travelling in small inflatable rafts and canoes or even just on foot. 'It rained regularly,' remembers Sainsbury, 'and we tried putting the equipment in polythene bags. But the problem is that if you have everything buried in a rucksack in bags and you see something you want to photograph, by the time you've got your rucksack off and the camera out, everyone else has disappeared over the horizon and what you wanted to photograph has long since disappeared from view.'

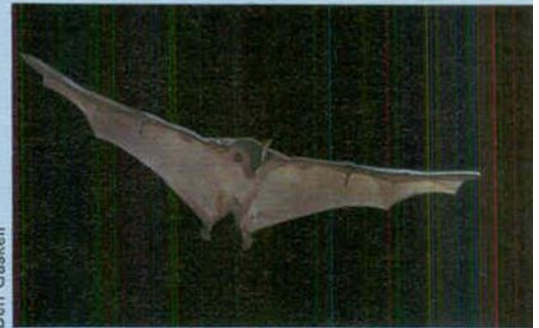
'Mostly we kept our cameras round our necks and hung polythene bags over them. The problem then is that you have sweat dripping down and running all over the camera and that is worse than sea water. It is very corrosive stuff!'

After Panama a new group of young explorers joined them for the journey through the Panama Canal and on to the Galapagos Islands. Here, where sunflowers have developed into trees and cormorants have forgotten how to fly, they studied and photographed the iguana instead of eating it, and three explorers on Santa Cruz found the only



Bat cave A motor driven Nikon F2 is triggered as one of this cave's 3000 bats breaks an infrared light beam

Bat mobile A fast electronic flash of 1/8000 sec was needed to freeze this rare blossom bat in flight

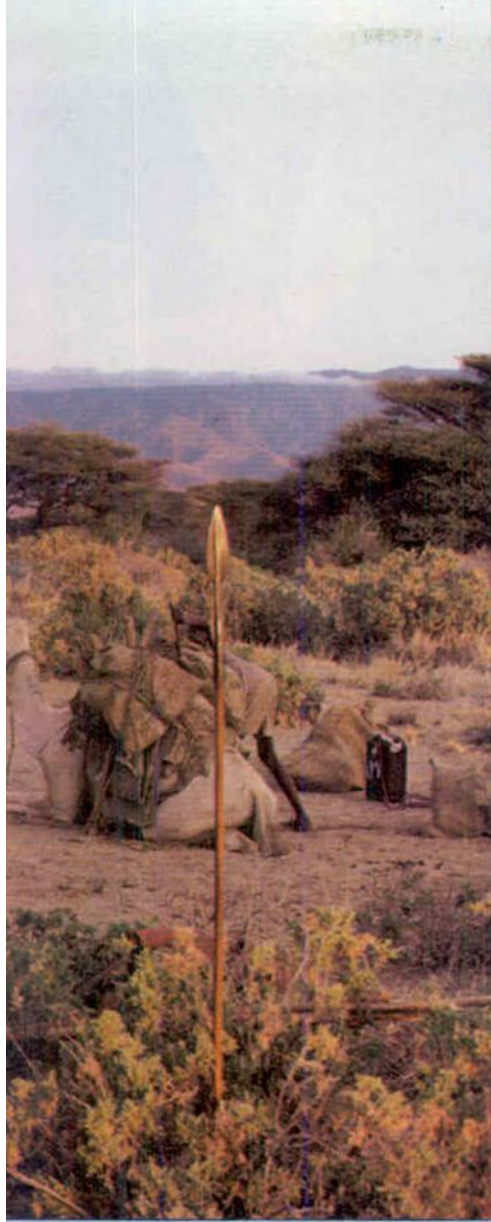


surviving female iguana of a near-extinct subspecies.

Crossing the Pacific, and out of sight of land for a month, they studied pollution by day in a marine biology project and spent nights sleeping on deck in the stifling heat or putting out buckets to catch water during the frequent torrential rain storms.

Around the world

This map shows the route taken by The Eye of the Wind. During its two year voyage, 350 young explorers from 27 nations visited 16 countries and took part in many research and aid projects



Christopher Sainsbury

Ben Gaskell

Rupert Ridgeway



Rare bat This is the first recorded photograph of the very rare harlequin fruit bat in Sulawesi, here suckling an infant. 105 mm Nikon micro lens

Crazy web This young argiope spider was taken with a Nikon F2. The pink blob is a food parcel and the shimmering web deters predators



Wana Derek Jackson, leader of the Sulawesi phase, talks with an inquisitive Wana tribesman via an Indonesian interpreter

Some of the most potentially dramatic pictures on board occurred during bad weather and in capturing the drama at sea Sainsbury ran the risk of getting a few cameras swamped by waves. His only regret about his dual role of photographer/watch officer was that when they hit a hurricane with 160 km winds, his first responsibility was towards the safety of the ship and he had to miss the action shots.

If he ever missed getting photographs, it was either because of his split responsibilities or because it seemed inappropriate. Working in remote areas of the world they often encountered people who strongly objected to being photographed or who insisted on being paid. 'On the whole it was our policy that if people didn't want to be photographed we wouldn't insist, nor would we ever pay to photograph anybody.'

After the long Pacific crossing they stopped in Fiji for several months and helped in rebuilding houses destroyed by the major hurricane in March 1979. Then in August they set out again for their next major land base in Papua New Guinea.

Here they chased the camera-shy Salvador monitor lizard in a hunt led by Blashford-Snell. They wanted to find a rare specimen that grows to dragon sized proportions, but though spotted in the bush the lizards were too quick to

be caught, even on film. Then local hunters caught a two metre specimen, and zoologist Ian Redmond with a film crew set up a hide beside a swamp and lurked patiently for days. Finally, they recorded sightings of lizards up to four metres long.

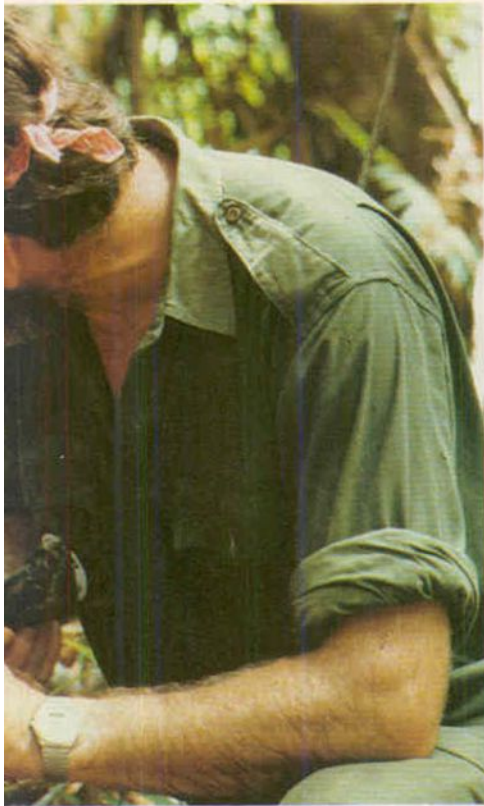
Another team trekked into the Finisterre Mountains marking walking routes to some of the many wrecks of World War 2 aircraft to be found there. Robbie Williamson led and photographed an underwater expedition on the north coast that discovered more than 40 wrecks of Japanese aircraft and ships sunk in World War 2.

With a Canadian fire jumper, Bill Neumeister, as photographer, another group tackled the savage rapids of the Strickland River in inflatable boats and watched helplessly as the boat of photographic equipment overturned. They recovered the boat—empty—50 km downstream before starting the first ever crocodile count on the river, conducted at night using torches to pick out the reflection of their eyes.

Loss and damage of equipment were not the only dangers that beset the photographers in these varying conditions. The black and white processing also posed its problems, as they had to send back a large number of photographs to their publicity office in the UK.

There was not space for a darkroom as well as a scientific laboratory on board the ship, so at each land based phase of the voyage Sainsbury and his fellow explorers would try to borrow a darkroom in a newspaper office, on a military base, or from someone whose hobby was photography.

'Once we had to use a darkroom in a



Rupert Ridgeway

house that was being rebuilt and it hadn't got a roof. It was a wooden frame which I had to cover with black rubbish bags, and every day the builders would come along and take some of it away and start building a wall round it.'

The biggest problem in processing was washing and drying the films and prints, because they rarely found clean water. Many negatives were scratched and ruined by grit.

In Papua New Guinea they were delighted to find an outdoor bath under a fire hydrant. 'It seemed an ideal place for washing all the prints until the local kids came along and jumped in.' They solved the drying problem by buying hundreds of clothes pegs and hanging the prints on every available washing line. In four months they had processed 8000 prints from Tri-X film.

At the beginning of 1980 they sailed for the next phase of the operation—Sulawesi, Indonesia. The main project was to survey an area of tropical rain forest that has since become the Morowali Nature Reserve. The expedition started in an area that was uninhabited except for groups of semi-nomadic forest dwellers, the Wana, who still hunt with blowpipes and poison darts. Despite their warlike reputation, the Wana displayed only polite interest in the expedition.

The survey team used Landsat satellite pictures and some aerial photographs to produce a vegetation map of the reserve while another team followed Ben Gaskell into the forest to collect bats for the British Museum. The collection of over 23 species, including seven unclassified bats, is an important one for the museum.

After Indonesia they sailed on to the Seychelles where they searched for geckoes and sheath tailed bats and discovered a new sub-species of the rare jellyfish tree on a mountain top. Their next major stop was in Kenya, where they were to carry out a series of game surveys and other scientific research.

Most of the game counts and photography of zebras, elephants and giraffes were done from Land Rovers, driving through the bush for hours on end. Some lucky explorers went up in hot air balloons one day to observe the herds of wildebeeste milling in the Masai Mara Game Reserve. Archaeological research, led and photographed by Mark Horton, revealed a city of spectacular Islamic ruins at a mediaeval site on Pate Island. At the end of 1980 *Eye of the Wind* sailed back from Africa through the

Sainsbury looked critically at the cabinets of Ektachrome 200 colour transparencies and remarked that some people thought Ektachrome film had a blue colour cast. 'We wanted a standard film,' explained Sainsbury, 'because in a lecture it's essential to use the same film stock throughout. If you start using different stock it upsets the audience, but they will get used to whatever colour cast a film has if you stick to it.'

In the end Operation Drake were left with an enormous and almost unmanageable collection of slides and negatives. 'Most of the transparencies have been thrown out,' Sainsbury explained, without a trace of rancour. 'I probably took about 10,000 in the first six months, so it was necessary at the end for someone else to sit down to a ruthless culling operation and throw most of them out.'



War relics During the expedition hundreds of abandoned army trucks were found in Papua New Guinea

Sideways look The ship's doctor photographs a crab in the warm waters of the Seychelles

Suez Canal to the Mediterranean and then back to the UK.

They had elected to take Ektachrome 200 film stock after discussions with Kodak to cope with the extreme variation in light so that the films could be processed quickly. Kodachrome film can only be processed in Kodak labs which are few and far between outside the western world. Ektachrome is also in light and so that the films could be processed quickly. Kodachrome film can only be processed in Kodak labs which are few and far between outside the western world. Ektachrome is also least affected by temperature and could be boosted to 400 ASA in the darkness of the jungle.

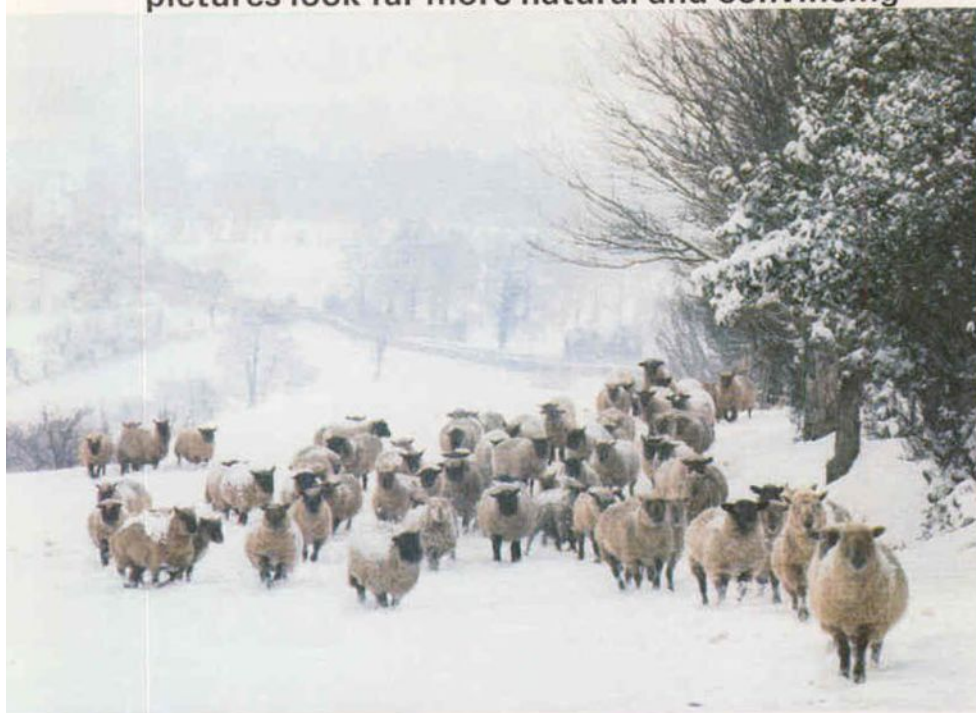


Christopher Sainsbury

Improve your technique

Filters for colour film

Filters are not just gimmicks for special effects. The right choice of filter can make your colour pictures look far more natural and convincing



Many factors can affect the way a colour photograph looks. For one thing, there is no colour film which, even under ideal conditions, will produce pictures that have exactly the same colours as the subject. And the same subject photographed under identical conditions gives as many different results as makes of film. Even different batches of the same film can vary from one to another, although these variations are kept to a minimum by the manufacturers and are not usually very important. The lighting conditions have a great influence on the appearance of the final photograph. Sometimes the light from the subject is not recorded by the film in the same way as it is seen by the eye—fluorescent lights appear white or pink to the eye, but green on film, for example.

Considering how many ways there are of combining different films with different subjects and types of lighting, it is clear that some method is needed to control the eventual result, especially with colour slide film which cannot be colour corrected from a negative, as can a print. Colour control is the main reason for using filters over the camera lens. It is more important when using

Sheep in the snow Light from an overcast sky has a blue cast. An 81B filter is needed for a neutral colour balance

Winter landscape Without a correcting filter, snow looks distinctly bluish under cloudy skies



slide film than when using negative film, but even pictures taken on negative film will be improved by using the correct filter.

Which filters to choose

There are many different types of filter suitable for use with colour film. Apart from those for special effects (which are explained in a later article), the main types are *ultraviolet* and *skylight* filters, *neutral density* filters, *polarizers*, *light-balancing* or *colour conversion* filters, and *colour compensating* filters. These all affect the colours of your pictures without greatly changing the way your camera records the basic scene. In fact, under many circumstances, these filters make your pictures look more 'normal' than they would if no filter were used, because film is less tolerant than the eye of subtle changes in the colour of light.

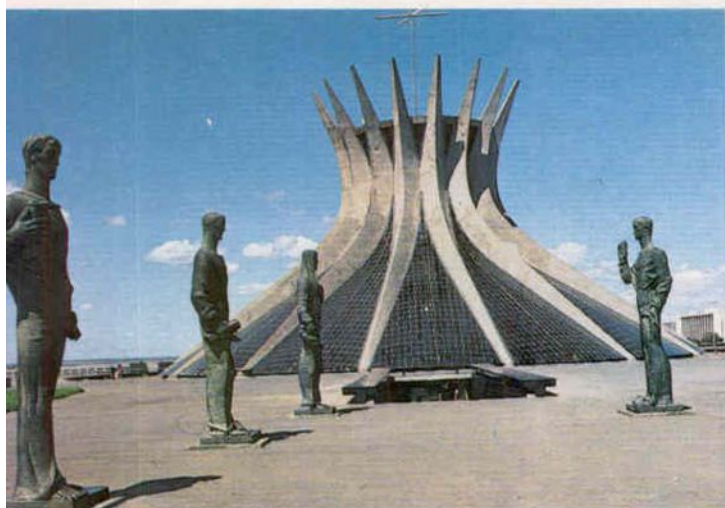
Filters are often described by a standard series of numbers, such as 81A or 82C. The numbers relate to the 'Wratten' filters produced by an English firm which was later bought out by Kodak. Wratten numbers have become almost universally used, whatever the origin of the filter. Sometimes the letter W is used in front of the number. For example, W3 means the light yellow Wratten 3 filter. A letter following the number refers to the intensity of the filter—an 81B is a stronger orange than the 81A filter.

Colour compensating filters are called CC filters. Each filter in this range is described by a number and one of the letters Y, M, C, R, G, or B. The letters stand for yellow, magenta, cyan, red, green, or blue, and the numbers describe the density of the filter—a 40Y, for example, is a darker yellow than a 20Y from the same series.

Filters are available in a variety of forms. The commonest is made of glass with a threaded retaining ring that screws into the front of a camera lens. The diameter of the filter must match the lens: 49 mm, 52 mm and 55 mm filter mounts are the most common. Square

Liz and Tony Bomford/Ardea

Trevor Wood



Without a polarizer The skies over Brasilia are deep blue, but need some help for a dramatic effect

plastic filters are also available. These fit into holders which take adapter rings to fit into many different sizes of lens filter thread. The Cokin filter system is an example of this type.

Gelatin filters offer the greatest variety. Squares of dyed gelatin are available in a great range of colours at relatively low cost. Their main disadvantage is that they are extremely delicate and must be handled very carefully. Furthermore, they need a special holder to fit on a camera lens.

Filters are usually put in front of the lens, but some special lenses such as fisheye and mirror telephoto types take smaller filters mounted behind the lens. Wherever filters are placed in the light path between subject and film, they must be of high quality and kept scrupulously clean so as not to lower the image quality.

Except for the colour conversion and some of the colour compensating filters, filters for colour work are much less strongly coloured than those made for use with black and white film. Many filters that are important to colour photography have almost no colour at all.

Ultraviolet filters

Ultraviolet (UV) filters are examples of useful colourless filters. All photographic emulsions are sensitive to ultraviolet radiation. This type of radiation is stronger at higher altitudes, where it is less filtered by the Earth's atmosphere, than at ground level. In colour photography ultraviolet radiation can make distant views appear abnormally blue, particularly in photographs taken on mountains or from aircraft. This problem can be partially eliminated by using a UV filter which screens out ultraviolet radiation while leaving visible light wavelengths unaffected. Because UV filters are colourless, and because there are very few photographs that will benefit from including ultraviolet radiation, many photographers leave a UV filter on each of their lenses all the

time. This also helps protect the front element of the lens from dust and damage, at the cost of a slight loss in definition that can be expected whenever filters are used.

Putting an extra layer of glass, plastic or gelatin between your subject and your film will always cause some degradation of the image. You should keep this to a minimum by handling your filters with care, so as to keep them free of dirt and fingermarks without the need for constant cleaning.

Skylight filters

These are also designed to reduce the blue casts which often occur in outdoor photography, especially under a clear blue sky. Skylight filters—usually numbers 1A and 1B—absorb some ultraviolet radiation, but have a slight additional pink tinge. When a subject is in the shade under a clear blue sky it will not be illuminated by the white or yellowish direct rays of the sun. Instead, most of the light falling on the subject will have the blue colour of the sky. The pink tinge of a skylight filter partially

Unfiltered flash Sometimes skin tones can look too cool when lit by electronic flash without a filter



With a polarizer The filter's angle of polarization has been set to maximize the contrast between sky and clouds

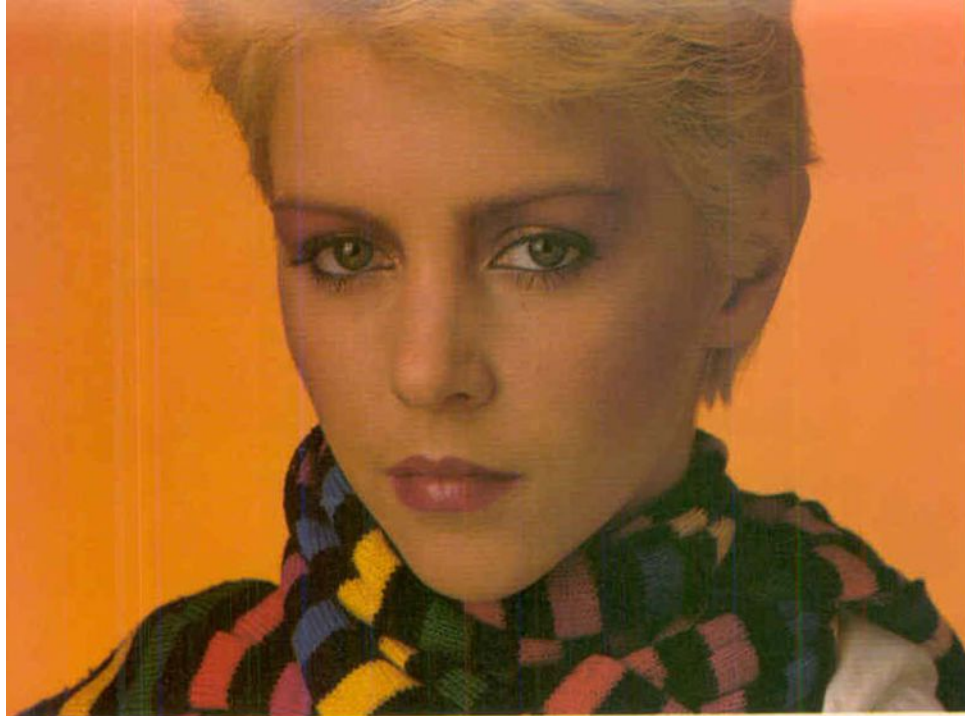
corrects this, and is particularly helpful when taking pictures that contain skin tones, such as portraits. While skylight and UV filters have an effect in clear air at high altitude, where the blue colour results from the strong UV content of the light, nearer sea level the blue colour of a distant view is often more due to scattered light than to ultraviolet. Skylight filters will have almost no effect on scattered light, and will not improve haze penetration.

Neutral density filters

UV and skylight filters have such little density that their effects on exposure can be ignored, but for some purposes you may wish to change your exposure with filters while leaving the colour rendering of your film unaffected. For example, if your camera is loaded with very fast colour slide film you may sometimes find under brightly lit conditions that you cannot set a small enough aperture and a

Flash with a filter To give a natural warmth to the skin tones, an 81B filter was used over the camera lens





Julian Calder

fast enough shutter speed to give your film the correct exposure. Alternatively, you may want to use a wide aperture for differential focus effects.

In such cases you should use neutral density (ND) filters. These plain grey filters have no effect on the colour of the light—they simply reduce its quantity. They are available in a range of strengths. An ND 0.3 cuts the brightness of a scene to a half of its original intensity, an ND 0.6 cuts it to a quarter, an ND 0.9 to an eighth, and so on. Each 0.3 of density is equivalent to one stop.

Using polarizing filters

Polarizing filters are also neutral in colour. Their purpose is to reduce or eliminate glare and reflections. Rays of light are usually made up of waves vibrating at many different angles. However, light reflected from non-metallic surfaces such as glass, water, or paint is *polarized*—only the waves vibrating in one particular plane are reflected. The degree of polarization depends on the angle between the camera, the subject and the light source.

A *polarizing*, or *Pola*, filter will only transmit light that has been polarized in a particular plane. In practice, this means that you can use a polarizing filter to remove unwanted reflections in windows, if you are at an angle of 30 to 45° to the reflecting surface. Polarizing filters will not remove reflections from directly in front of a surface, nor will they affect reflections in mirrors, which rely on a metallic backing layer for the image they produce. Because polarizing filters reduce surface reflections from many subjects, they often increase the strength and saturation of colours generally.

Polarizing filters can have a spectacular effect on clear blue skies. When sunlight is scattered by the atmosphere it becomes polarized. The degree of polarization is strongest at right angles to the sun, and some polarizing filters

Woman with scarf An 81C filter was used with slight underexposure to give richer, warmer skin tones and a more flattering effect

have a small symbol on their rim that can be pointed at the sun to align the filter for the maximum effect. Skies photographed through a polarizing filter have a vivid blue colour that is extremely rich and striking in effect.

If you take your exposure readings with a separate hand held exposure meter, you will need to give an extra 1½ to 2 stops exposure above that indicated by the meter when you use a polarizing filter. Cameras with built in through-the-lens exposure meters will usually make the necessary allowance for exposure automatically, but there are some exceptions. Refer to your camera's instruction book: if your camera's metering system incorporates

any kind of beam splitter, it may give inaccurate readings through a polarizing filter. In such cases, you can use a more expensive circular polarizing filter which will work with all types of built in meters.

Polarizing filters are designed to be freely rotated when they are fitted to the lens, and they are therefore usually in thicker mounts than normal filters. When used with wide angle lenses, this may cause vignetting at the corners of the image. To avoid this problem some camera manufacturers produce polarizing filters in larger than normal mounts. Alternatively, you can buy a larger polarizing filter and fit it to your camera lens with a *stepping down ring*.

Matching light to film

The main purpose of the 81 series of light balancing filters is to make small changes to the colour of the light reaching the film so that it more closely matches the colour temperature for which the film is balanced (see pages 220 to 221). Most daylight slide films are balanced for a colour temperature of about 5500 K. The orangeish 81 series lowers colour temperatures over the range 5700 to 7500 K to approximately match film balanced for 5500 K. The blueish 82 series raises colour temperatures over the range of 4400 to 5200 K to approximately 5500 K.

What this means in practice is that you can use these filters to make your film give neutrally colour balanced pictures under a variety of common lighting conditions. For example, 82 series filters are useful in the early morning or late afternoon. The reddish colour of light at such times of day is very attractive with some subjects, but may be too strong for your taste. Adding a blueish 82C filter and giving an extra 2/3 stop exposure will give a more normal effect. The 82 series filters are also useful when using tungsten balanced



Hyacinths by tungsten Photographed by the light of 500 watt bulbs on daylight balanced film



Colour conversion An 80A filter on the camera lens reveals the true colours of the plants

John Sims

film with ordinary household light bulbs. Tungsten film is meant to be used with 500 W photographic bulbs, but 100 W bulbs have a lower colour temperature and call for an 82B filter with 2/3 stop extra exposure for accurate colour.

The 81 series is valuable when the sky is overcast. An 81C filter with 1/3 stop extra exposure will remove any blue cast under such conditions. An 81A filter will correct photoflood lamps for use with tungsten balanced film.

Because the colour temperature of light is very difficult to estimate, it is impossible to give precise recommendations for the use of light balancing filters under every circumstance. Expensive colour temperature meters are available to help you find out exactly which filter you need, but these are not usually necessary. As a rule, your error in colour balancing should be on the warm side, so that your pictures are a little redder than the ideal balance. Photographs that are too blue are usually less acceptable than photographs that are a little too red or yellow.

Colour conversion filters

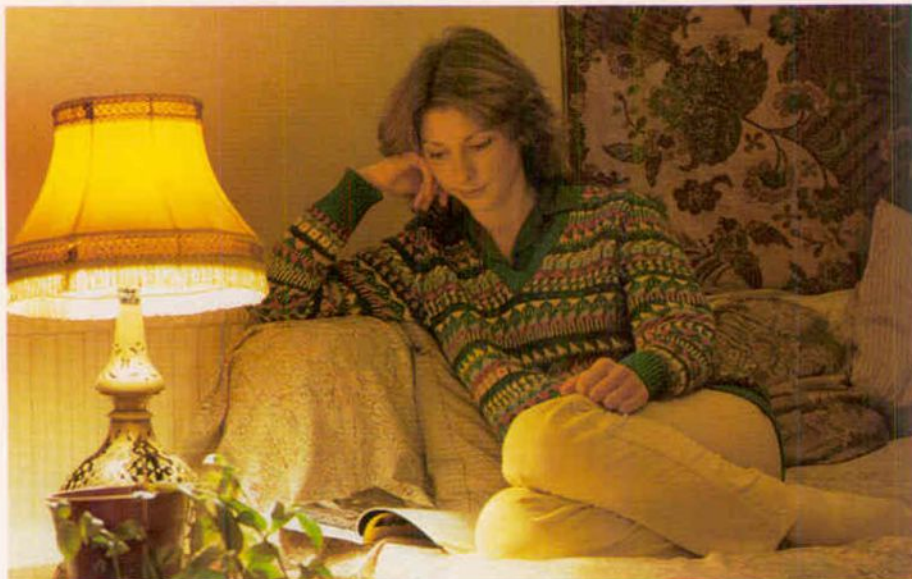
These are similar to, but much stronger than, colour balancing filters. The 80 series of filters are a deeper blue colour than the 82 series, and allow daylight film to be exposed by tungsten light. The main practical problem with these filters is that they need a 1/3 to 2 stop exposure increase. With most colour films, used under the sort of light levels that are commonly given by tungsten light bulbs in ordinary interiors, this will mean that you must put your camera on a tripod and use a longer than normal exposure time. You cannot usually put an 80 series filter on your camera lens and take hand held photographs indoors.

Orange 85 series filters, which allow tungsten balanced film to be used by daylight, need less exposure increase—1/3 to 2/3 stop. Since daylight is usually much brighter than artificial light, taking pictures with a hand held camera and tungsten balanced film is quite practical if an 85B filter is used. Nevertheless, it is better to use film that is made to match the approximate colour temperature of the light you are photographing by.

Filters for skin tones

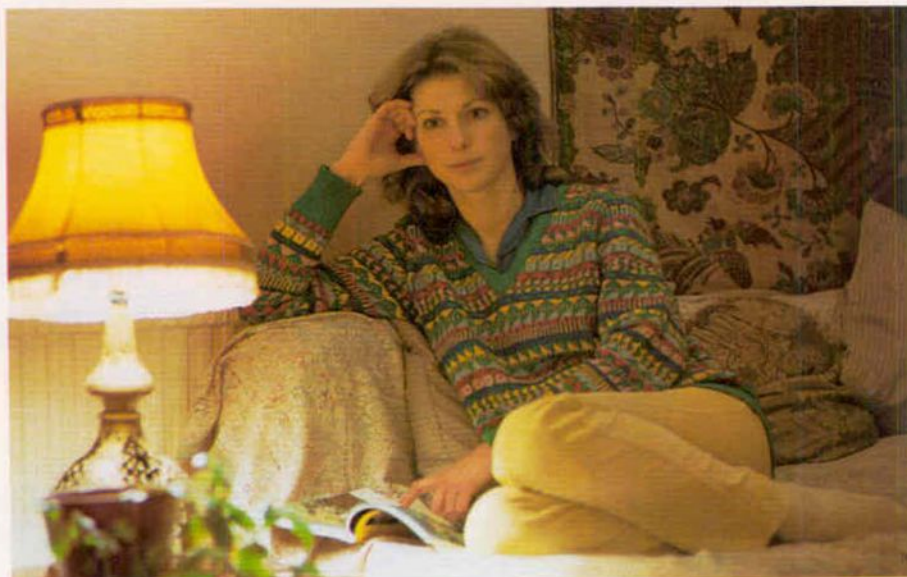
The eye will accept a considerable departure from natural rendering of skin tones if the added colour cast is warm. Warm brown skin tones are associated in most people's minds with health and cheerfulness. The 81 series of light balancing filters can remove the slight tendency towards cold pink tones found in many pale skins. The 81 series runs from the plain 81 filter, which has a slight warming effect, up to the 81EF, which produces an 'instant sun tan' and is popular with glamour photographers.

Magenta filters are also often useful for removing the green cast you often see in skin tones when there is a nearby expanse of grass or leaves reflecting light onto the subject. An O5M colour



Woman reading Low-wattage household lamps give a result that is slightly too warm on tungsten film

Colour balancing A slight adjustment with an 82C filter gives a cooler, more neutral result



John Sims

compensating filter is usually strong enough for this job, but you may want to use a 10M filter if you are photographing a model who is surrounded by a large area of foliage.

Fine-tuning your colour

The colour compensating (CC) filters allow for small variations in colour balance when colour films are being used. All such films have three emulsion layers, sensitive to red, green and blue light. Each colour CC filter is designed to affect one layer only: the cyan affects the red, the magenta the green, and the yellow the blue layer. The range of CC filters allows an almost infinite variety of correction. In theory it is possible to reproduce many of the effects of other colour filters by suitable combinations of CC filters, but in practice it is not advisable to combine more than two CC filters in the image forming beam.

Most photographers who use CC filters

extensively keep an assortment of the less expensive gelatin type, but more durable glass CC filters are available.

Points to remember

Never touch the surface of your filters. Gelatin filters in particular are very delicate and can be permanently damaged by fingerprints.

Keep filters in their cases or packets when they are not in use. Clean filters are essential for good results.

Try to keep the number of filters in use at one time to a minimum.

Buy the best filters you can afford. Many good filters these days are multicoated, like camera lenses. There is little point in using multicoated lenses to reduce flare if your uncoated filters add flare of their own.

Do not forget to take any filters off your lenses after you have finished using them—some of the CC filters are so pale that you may not notice you have left them on.

Choosing your first enlarger

If you have never used an enlarger before, it is hard to know what to look for when purchasing one. It is not necessary to spend a lot of money, but careful buying can make darkroom work much easier

If you decide to set up your own darkroom, whether it is improvised or a permanent arrangement, its central feature will be an enlarger. As your skill increases, many hours will be spent using this piece of equipment. To ensure that your time is not spoiled by irritating minor frustrations arising from awkwardly placed controls or badly designed features, it is advisable to take a particularly close look at the alternative enlargers on the market.

All enlargers work on the same principle. They have a light source which illuminates a piece of film. The emerging rays are focused by a lens, which forms an image of the negative on a sheet of light-sensitive printing material. In most enlargers these components—the light source, negative stage and lens—are incorporated within an 'enlarger head' which is supported by a metal column. The column is fixed to a baseboard on which the printing paper can be placed.

The light source

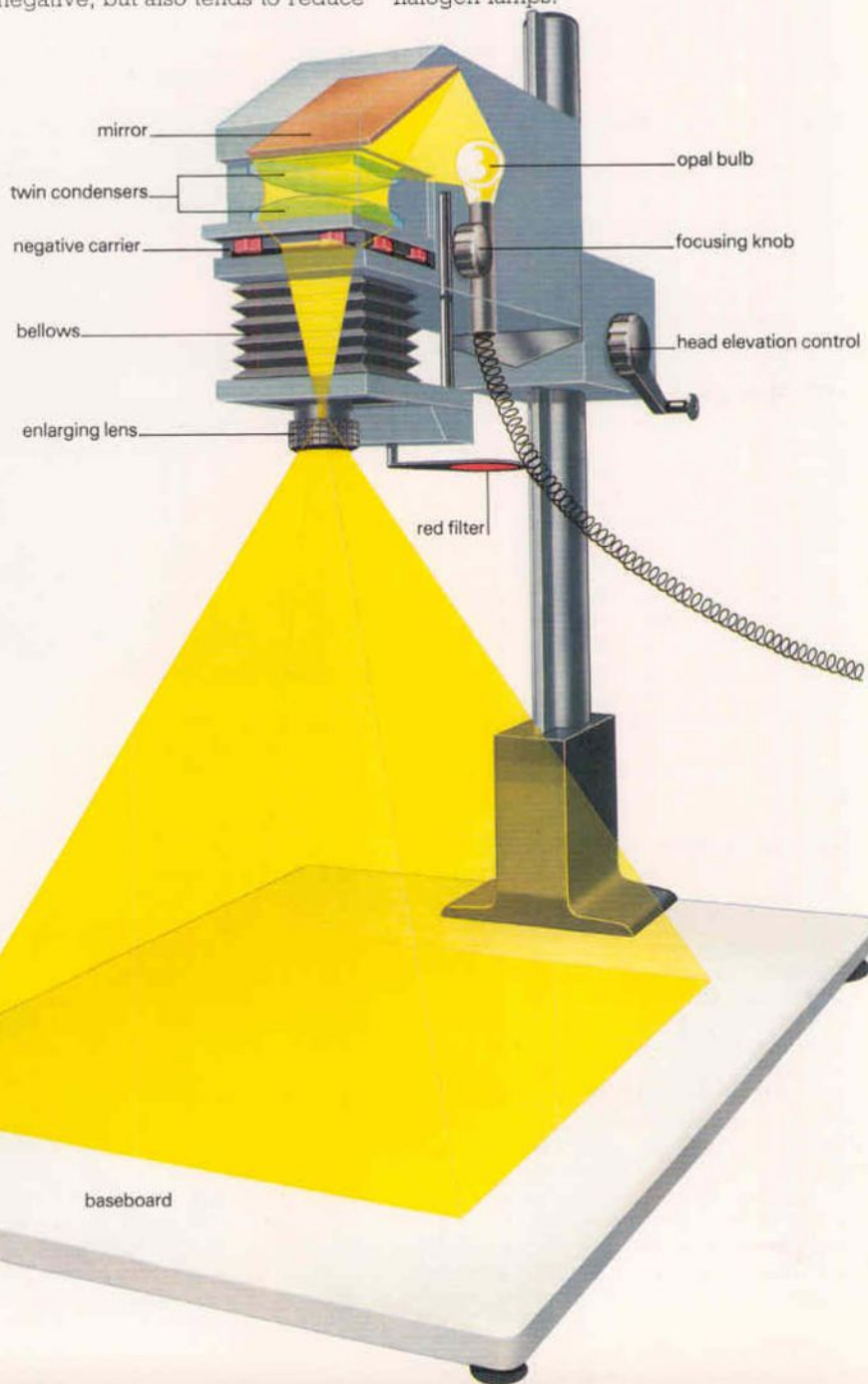
The design of the optical system is a particularly important consideration. For most basic 35 mm enlargers, an opal photographic lamp between 75 W and 150 W is the light source. The image on the enlarger baseboard must be illuminated evenly, so before the light reaches the negative it is either concentrated by an arrangement of simple lenses called condensers or diffused by a translucent sheet.

Most basic 35 mm enlargers use the condenser system. To make the most efficient use of the lamp light, condenser systems are matched to specific negative sizes. In a 35 mm enlarger, the condensers concentrate all the light from the bulb over the small area of the negative. Light rays from the bulb are, therefore, almost parallel when they pass through the negative, but come to a focus within the enlarger lens. The benefits of this system are relatively short printing times with crisp, contrasty detail. The disadvantage is that con-

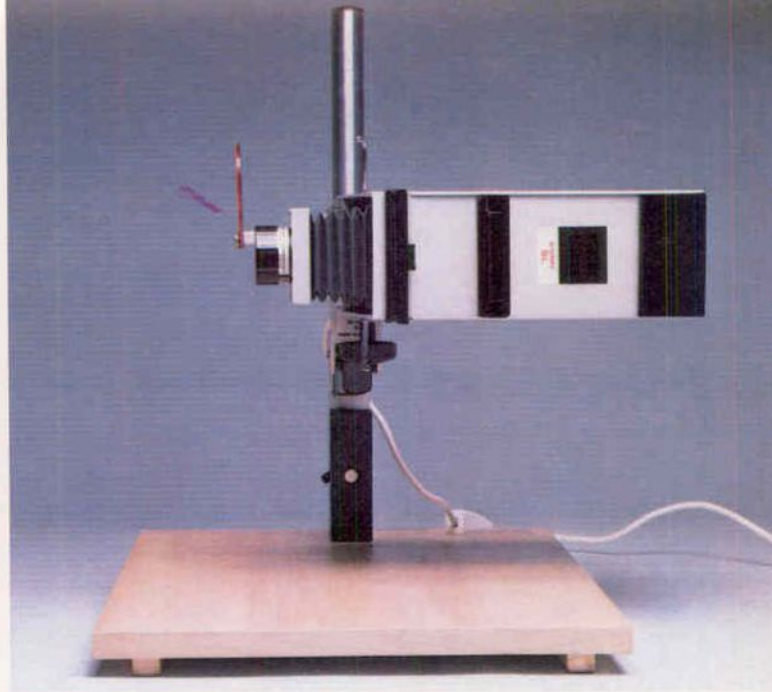
denser illumination emphasizes all the imperfections of the negative, such as scratches and dust.

Diffuser light sources work in a different way. They substitute an opal or frosted sheet for the condensers. This scatters light in all directions so the light rays approach the negative at several angles. This diffused light reduces the effect of surface imperfections of the negative, but also tends to reduce

the contrast of the image. Diffusers, unlike condensers, do not direct light efficiently through the film, and they therefore tend to give a dimmer image unless they are fitted with a more powerful lamp. For these reasons, diffuser light sources are most commonly found on enlargers designed primarily for colour printing—and are fitted with colour filters and powerful tungsten-halogen lamps.



Enlarger construction All simple black and white enlargers work in much the same way. This cutaway picture shows the path of the light from the lamp, via a mirror (omitted from some enlargers) through condensers and negative, and finally through the lens to form an image on the printing paper



The column and chassis

The purpose of the column is to support the enlarger head above the baseboard. It should be constructed so that the head is completely free of vibration during exposure of the paper.

Most columns are vertical although some longer ones are inclined at an angle of about 30°. This allows very large images to fall clear of the base of the column.

The columns on the simplest enlargers are usually single tubes of plated steel. The height of the column varies considerably from model to model but is usually from 60 cm to one metre. The height of the column is important, because it dictates the maximum print size that can be made. If you intend to make a lot of large prints, buy an enlarger with a long column.

Other types of column include double tubes, which give a firmer support, and box columns, which are usually rectangular in cross section and give a very firm support. The flat front surface of a box column is often calibrated on more expensive models, and this enables various image sizes and exposure calculations to be made without direct measurement of the height of the enlarger head.

As the enlarger head is heavy and carried clear of the column, the bracket that supports it must be robust. This bracket normally incorporates a mechanism by which the head is positioned at the selected height. On most enlargers this is a friction brake. It is secured by either a locking screw or a spring loaded lever. More advanced models sometimes use a rack and pinion mechanism which raises the head up the column when a crank is turned. This method of head elevation is the most positive and secure, and allows the most accurate positioning of the head.

For occasional large prints, many enlargers allow the column to be swivelled to project onto the floor, and

a few have an adjustable bracket that lets the head turn so that the image falls on the wall of the darkroom. Both these methods produce larger images, but are inconvenient if many giant prints are to be made.

The negative carrier

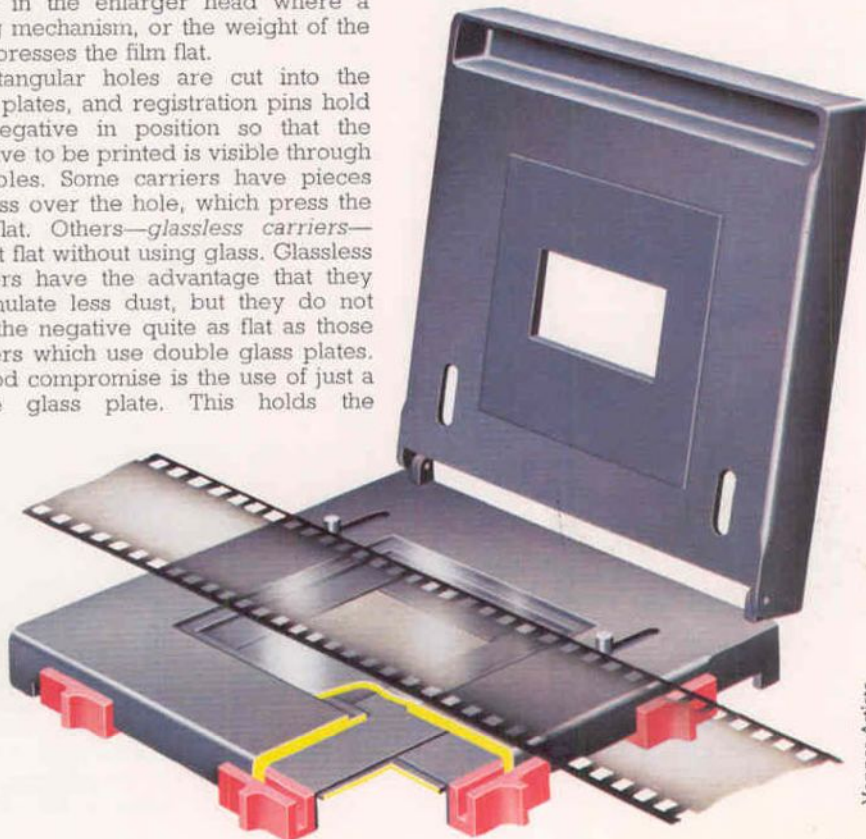
The negative to be printed should ideally be held perfectly flat, and parallel to the printing paper. This is usually achieved by placing the film between two plates of metal, hinged together at the back. This arrangement is called a *bookform carrier*, because inserting the negative into the carrier is rather like putting it between the pages of a book. The carrier slides into a slot in the enlarger head where a spring mechanism, or the weight of the head presses the film flat.

Rectangular holes are cut into the metal plates, and registration pins hold the negative in position so that the negative to be printed is visible through the holes. Some carriers have pieces of glass over the hole, which press the film flat. Others—*glassless carriers*—hold it flat without using glass. Glassless carriers have the advantage that they accumulate less dust, but they do not hold the negative quite as flat as those carriers which use double glass plates. A good compromise is the use of just a single glass plate. This holds the

Inside the head Large glass lenses, called *condensers*, collect the light from the bulb, and channel it down to the negative, which is held in a carrier located directly below

Turning the enlarger The largest size of print that an enlarger can produce need not be limited by the height of the column—often the head turns to project the negative on to the wall

Negative carrier Some carriers can be used with several different film formats, and this one has four sliding masks which allow the printer to mask off those areas of the negative that are not going to appear in the print





Filter drawer You do not need a colour head to print colour pictures on your enlarger, because you can insert individual filters into the small drawer that is found on almost all enlargers, above the condensers

negative flat but does not gather as much dust as two sheets of glass.

A further difficulty with glass carriers is that where the negative is pressed closely into contact with the glass, a pattern of concentric rings appears in the picture. These are called Newton's rings, after the scientist who first noticed them. They will show up on the print, and if they appear in the sky, or some other area of flat tone, they can be very unsightly. The glass plates of the carrier can be acid etched to prevent Newton's rings, and such glass is called *anti-Newton glass*. This is expensive, and many enlarger manufacturers opt for the cheaper alternative of glassless carriers.

Not all carriers are of the bookform type. A few enlargers use a simple plate upon which the film is placed and held flat with the weight of the lower condenser. This is not just a cheap alternative—some of the best enlargers ever made have used this system.

When buying an enlarger, it is a good idea to pay particular attention to the negative carrier. A good carrier is a pleasure to use, but some of the worst ones can make darkroom work a nightmare. A few carriers have useful features that will improve the quality of your prints. The most important of these is a system of sliding masks, which move across the frame just below the film. When printing a small section of a negative, the masks can be moved to block off those areas of the picture that are not going to appear in

the final print. The purpose of this is not to compose the picture—the masks are not usually quite in focus—but to block off scattered light that would otherwise be reflected back onto the print, thereby reducing contrast.

Things to avoid in negative carriers include fiddly methods of construction—some carriers consist of four plates of metal which have to be assembled in the correct order each time the carrier is removed from the enlarger. This can be very annoying. Another point to watch is the area of the aperture through which the film is visible. If the hole in a glassless carrier is too big, the film will not be held flat, and light will spill into the picture from the edges of the negative. If it is too small, not all of the negative will be visible, and you will not be able to print the whole frame. If the carrier is glassless, a few minutes work with a file will cure this, but if it is not, there is very little that can be done.

Lenses and mounts

Most enlarging lenses are attached into the head of the enlarger by a screw thread fitting. This is generally a standard size—39 mm—so most enlarging lenses are interchangeable.

The lens is threaded into a mounting plate. On a single format enlarger, for example, designed to be used with 35 mm film only, the plate is usually fixed permanently into the head. When the enlarger is made to print more than one size of negative the lens screws into a special plate which is then fixed to the enlarger, often with a quick release device. There is a simple reason for this—different lenses must be held different distances from the film, so that while the lens mount for a lens that covers the 120 roll film format will simply be a flat plate, the mount for 35 mm is recessed so that the lens sits closer to the negative.

If you print your own photographs, then the quality of the final picture will be limited by the weakest link in the image forming chain. If you buy a cheap enlarging lens, then however good the lens on your camera is, the print quality will never be first rate. The quality of lens on the enlarger is therefore of great importance.

Enlarging lenses are generally much cheaper than camera lenses because they are much simpler in construction both optically and mechanically. The diaphragm mechanism is simpler, and the job of focusing is done by the enlarger, not the lens. Enlarging lenses come in a variety of maximum apertures, just as camera lenses do, but in the darkroom maximum lens aperture is less crucial. The only virtue of a lens with a wide maximum aperture is that it makes focusing easier because the image is brighter. Unless you plan to make a lot of giant enlargements with images that are dim and hard to focus, the extra cost of a lens with a wide maximum aperture is not justified.

For a 35 mm negative, the normal

focal length of the enlarging lens is around 50 mm. For roll film, it is 80 mm. Although these focal lengths are standard, it is possible to buy wide angle lenses for enlargers. These will produce a larger image on the baseboard than the standard enlarging lens when the head is a fixed height up the column, but are usually specially computed for big enlargements, and do not give their best performance on prints smaller than 25 to 30 cm wide. The apertures on enlarging lenses are marked by click stops. When a lens is used in a recessed mount, this might be the only way of determining which aperture is in use, since the markings are frequently difficult to see. For this reason, it is essential that the click stops are firm and positive.

The quality of an enlarging lens is difficult to judge until it is actually used for making prints. The only real guide to quality without actually testing a lens is to buy a brand that is well known for producing top quality results. Schneider, Nikon, Soligor, Vivitar, and Minolta all make enlarging lenses that can be relied upon to produce good results.



John Wainwright

Focusing methods

As the enlarger head is moved up and down the column to change the size of the picture, the lens must be moved closer to the film or further away from it to bring the image into focus. The lens mount on many enlargers is fixed to the head by a pair of rods. These are driven by a handle which racks the lens in and out when turned to focus the image. A bellows or sliding tube arrangement prevents stray light from spilling out of the enlarger. Alternatively, the lens mount is fixed into a helical screw mechanism, and the lens is focused as it is in a camera—by turning a focusing ring. Both these methods work equally well, though helical focusing is the less common of the two methods.

A few enlargers have automatic focusing. When this system is perfectly adjusted it can save a lot of time, but the manufacturing tolerances involved in making such a system are small, and the enlarging lens has to be precisely matched to the enlarger. Consequently, good autofocus enlargers tend to be very expensive. The cheaper ones should be avoided.

Other features

If you plan to do any colour printing on your enlarger, make sure that it has a *filter drawer*. This is a small drawer located above the condensers, in which coloured filters can be placed to change the colour of the light from the enlarger. This is essential for colour printing, and is also useful for black and white, where filters can be used to change the contrast of certain types of paper.

Instead of a filter drawer, many enlargers are available with a *colour head* fitted. This is a light source with continuously variable filtration in yellow, cyan and magenta colours. Although not essential for colour printing, it does make life a lot easier.

If economy is a priority, but the idea of colour printing in the future sounds attractive, many enlargers have colour heads available as an optional accessory which can be purchased later.

Which model?

The most suitable enlarger is the one that fits your needs and your wallet. There is nothing so frustrating as having an enlarger that limits your creativity in the darkroom, but on the other hand it is senseless to spend so much on an enlarger that there is no money left to buy photographic paper.

If you only expect to do a small amount of darkroom work of a fairly limited nature—no large prints, and no colour, for example—your choice of equipment will be very broad. The more specialized your need, the narrower will be the choice. Think carefully about the largest size of print that you expect to make frequently, and make sure the enlarger is able to print pictures this big. Check that the head will turn or the column swivel for the occasional giant blow up. Examine the negative carrier carefully, and make sure that it is easy to use. Be certain that if your photographic horizons are likely to expand, the

enlarger can expand with them. It is no use buying a roll film camera, and then finding that you cannot adapt your enlarger to take the film format.

If you have special needs, remember that all enlargers are made to suit the average user. Left handed photographers often have problems with controls designed for right handed people. Some makes of enlargers have head elevation and focus controls on both sides of the head, which gets around this problem. If you expect to store the enlarger in a cupboard, bear this in mind when buying, and check that the unit can be dismantled and reassembled easily.

Above all, make sure that the enlarger you buy is built to withstand the wear that it is likely to get. If more than one person is likely to use it, make sure that it is very well made, particularly for young or inexperienced photographers.

Enlarging accessories

Certain important accessories can be bought to make many aspects of darkroom work either easier or more straightforward. On the enlarging side, top of the list of desirable items is a timing device which is used to switch the enlarger on and off in place of a conventional switch. A timer leaves both hands free during exposure (which may be important if you have to dodge or burn-in a print), and is a far more satisfactory alternative to other methods of counting the seconds for the exposure. This accuracy enables meaningful test prints to be made—and is also particularly useful when a long run of prints of the same exposure has to be made and where consistent print exposure is required.

Various types of printing easel are available. This is one of the more basic accessories which you do need to obtain. In any form, a printing easel (also called an enlarging easel, or a masking frame) exists simply to hold paper flat during exposure. The conventional type employs sliding arms in conjunction with a border-masking frame arrangement which keeps the paper flat. The arms are, in fact, masks which can be adjusted to different print paper (or image) sizes. Another type uses magnetic corner pieces to hold the paper firmly in place but gives a borderless image. Other borderless easels use either a tacky surface coating or tape to keep the paper flat. At least one type of easel permits a variety of fixed print sizes to be printed on a single sheet of paper.

Often the negative image on the easel is dim, making it difficult and tiresome to focus. This can be made easier by using a simple device called a *reflex focus aid*. This has a mirror magnifier which enables you to see the grain structure of the enlarged image large and bright for easy focusing. You simply place the magnifier on the easel, inspect the image, and adjust the focus of the image until it becomes crisp—a simple but effective device.

Man's best friend

Even a cheap enlarger will give good b & w prints. The quality of the enlarging lens, however, is the vital factor for print sharpness

Enlarger choice

All these three enlargers are basic b & w models. Any of them would be suitable for a beginner



Suburban street

An ordinary suburban street may not sound like an ideal subject for an assignment, but, after looking carefully, Sergio Dorantes found plenty to photograph



Sergio Dorantes

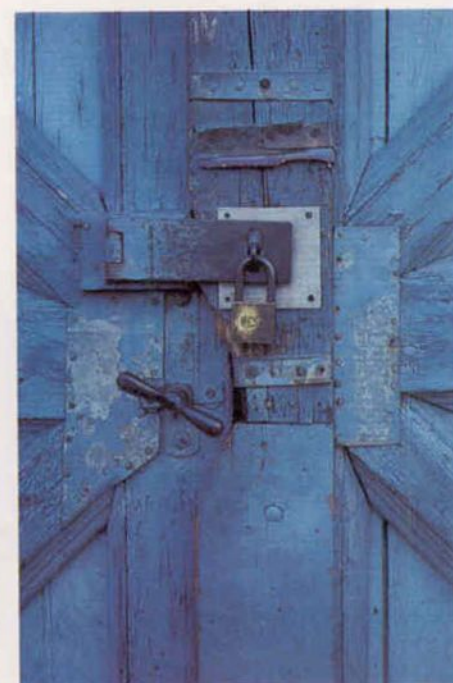
Visiting the United States in winter, Sergio Dorantes wanted to take full advantage of the extensive variety of subjects which are available there. In this series alone, he managed to think of a wide range of subjects which conveyed the atmosphere of a single suburban street.

Sergio's visit to the area coincided with a fairly heavy snow fall, so the

wintery conditions strongly influenced this series of images. Although he did try photographing a view of the whole street, Sergio concentrated on isolating small details which seemed to capture the flavour of the scene. As he explained: 'To me this suburban street looked rather uninteresting from a distance. Before I could do very much I had to overcome the psychological barrier I found in photographing such a limited area. But when I moved in closer to look at individual houses I started to notice small features which are so typical of the area.'

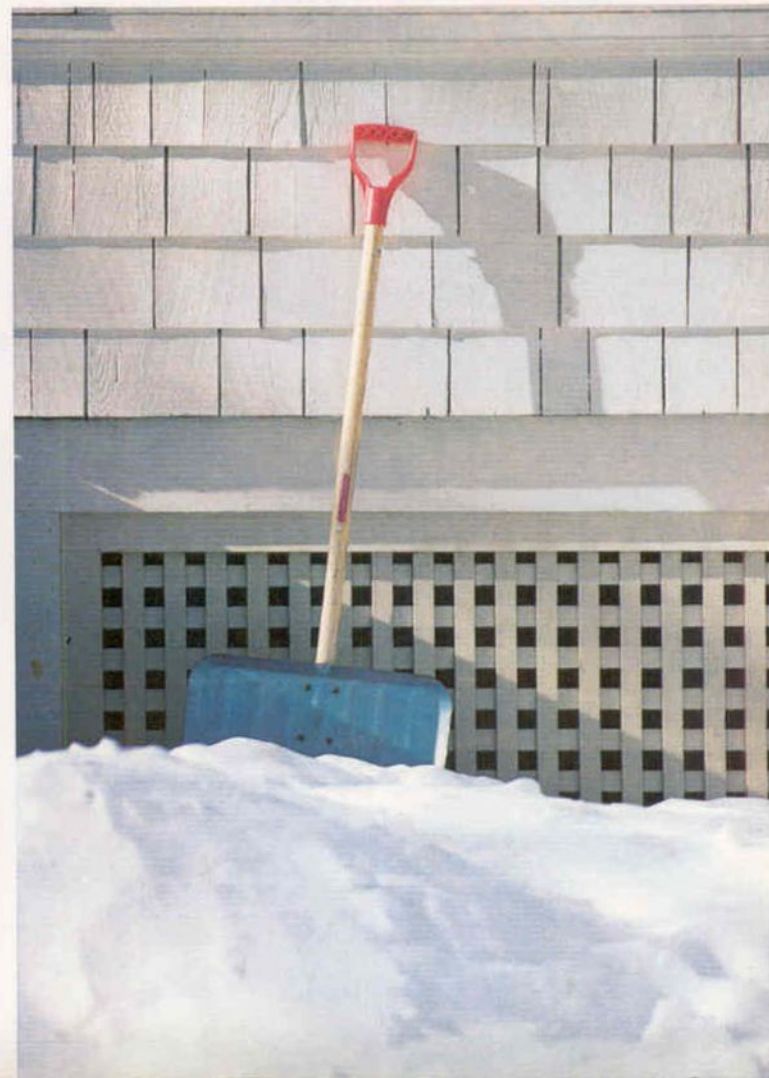
These details are what really enable the series to convey a sense of place. A snow shovel, a pair of aluminium shutters, the bonnet of a car, a screen door, a mail box—all these details are brought to attention and combine to illustrate the character and 'feel' of the street.

The whole street Sergio began the series using a 28 mm lens for a wide shot of the street and deliberately included his own shadow. **A window with shutters** After fitting 105 mm and 200 mm lenses to his two 35 mm SLR bodies, Sergio could concentrate on carefully framing the details he noticed. **A shrivelled creeper** and a **letter box** were among them



Bare tree The sun behind this tree attracted Sergio's eye, but he had to judge the exposure very carefully. **Padlocked door** Fitting a 55 mm macro lens, Sergio framed this shot to emphasize the pattern and texture of the woodwork. **Front door and snow shovel** Telephoto lenses allowed the garden fences to be left out so the main subjects could fill the frames.







Smiling faces Although the design of the houses was an interesting aspect of the assignment, Sergio thought it would be useful to include a picture of a group of children outside enjoying the snow. This also helped to add colour to the series

Frozen car The snow on the car helped create this composition which was also made interesting by the shadow of the car's emblem **Mail box** To help establish a sense of place Sergio also included a shot of a characteristically American mail box





Improve your technique

Light throughout the day

A perfect sunny day with scarcely a cloud in the sky: most photographers agree that such a day is excellent for taking pictures. But you must know how to use the light for the best results

Light is the raw material of photography. If you want to make the best use of outdoor light in your pictures, you should know how it changes in character at different times of the day throughout the year.

Natural light

Natural light comes from only one source—the sun. But the sun's light can be diffused and reflected in different ways so that it behaves much more subtly than any single light source in the studio.

As well as the direct light of the sun, natural light can be made up of scattered blue light from the sky, light reflected from clouds, light diffused through clouds, light reflected from the ground and from buildings and objects, and light filtered through such things as trees and bushes.

The sun's light changes in colour, depending on its position in the sky and

on atmospheric conditions. It changes in intensity through the day and during the year. When the sun is highest in the sky, at midday in summer, its light is much stronger than at dusk or dawn in winter. And the direction of the sun's light changes constantly; a building or landscape that is lit by flat direct light on a summer's morning will be lit completely differently on a winter's afternoon.

Geography is important. The quality of the light—its strength, intensity, colour, and the contrast ratio between those parts of the subject lit by the direct light of the sun and those in shadow—is affected by both natural and man-made factors. In areas like the Mediterranean, California and Australia, the light is generally much clearer and brighter than in more heavily industrialized areas

at higher latitudes, such as north-east United States and Britain.

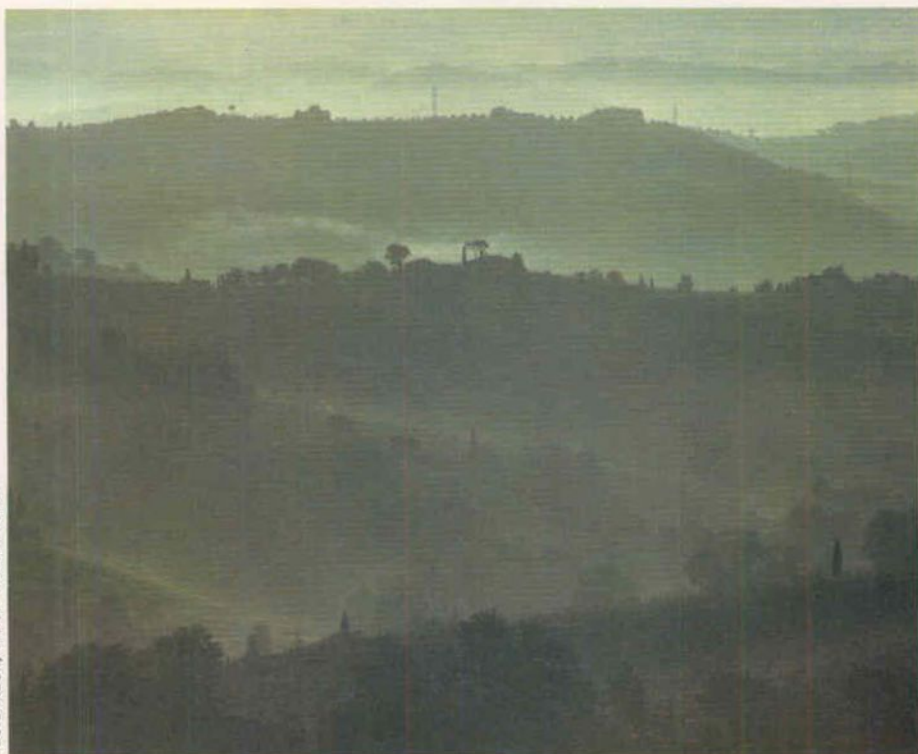
Despite all these influences on the character of natural light, you can think of light outdoors as having two main parts: direct sunlight and reflected sunlight. How these components interact determines what the light is like.

The sun

At an average distance of about 150,000,000 km, the sun is the nearest star to the Earth. Terrestrial distances are insignificant by comparison, so the sun's light is one light source that is not affected by the inverse square law (see pages 254 to 255) for practical photographic purposes. As seen from the Earth, the angular diameter of the sun is a tiny half a degree. Sunlight is therefore close to being a point light source, and

Stonehenge at dawn *The strong contrasts between the brightening sky and the deep shadows of dawn provide excellent opportunities for silhouettes*





Morning landscape *Early morning mist in Tuscany shows an extreme example of the effect of aerial perspective—the loss of detail over distance*

Cats on cobbles *Later in the morning, the slanting light helps to emphasize textures on walls and streets, which disappear when the sun is higher*

would give sharp edged shadows and very high contrast between lit and unlit areas of the subject if it were not for the softening effects of the many sources of reflected light on Earth.

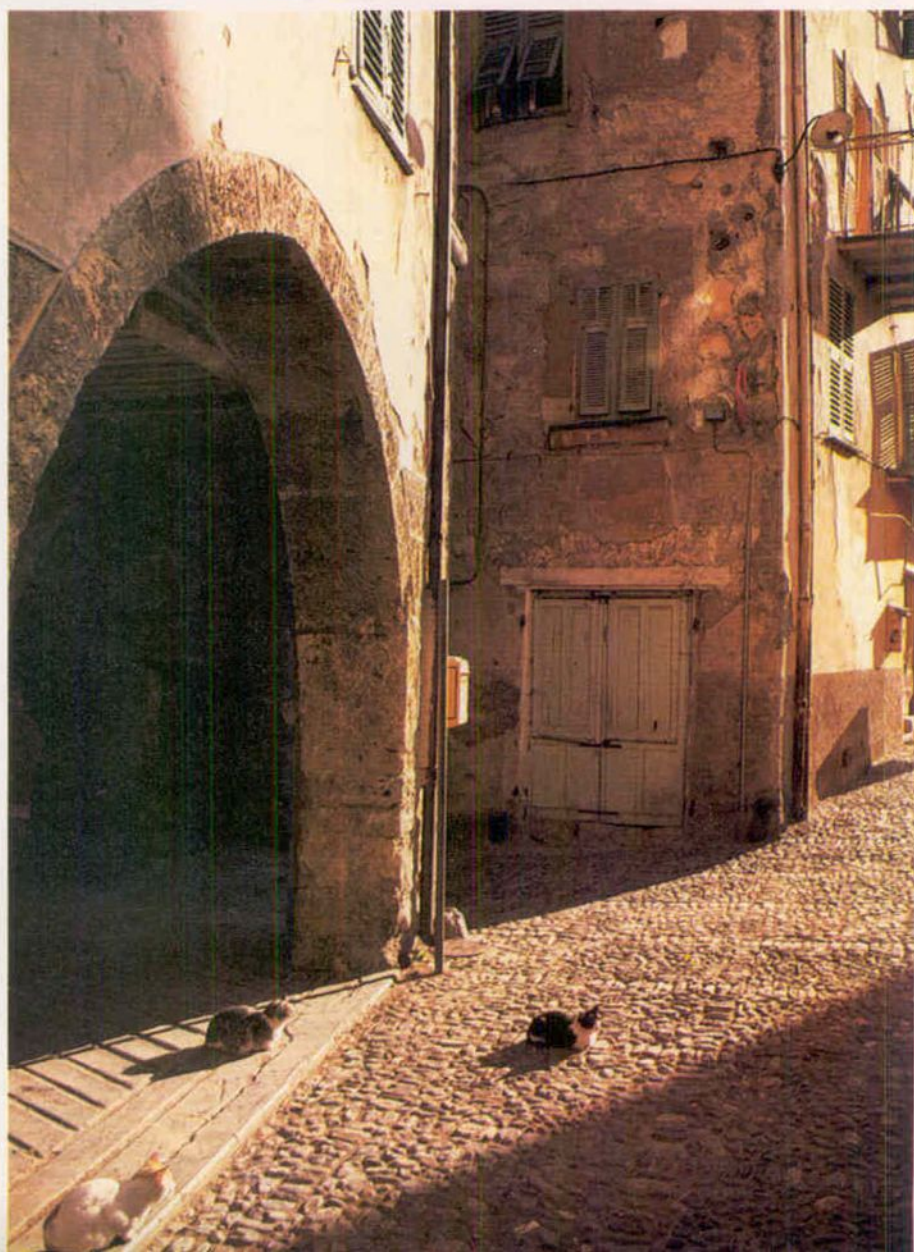
The sun's light has a colour temperature of about 5,500 K, a slightly yellowish-white (see Understanding Colour Temperature, pages 220 to 221). But the Earth's atmosphere can affect the colour of sunlight considerably.

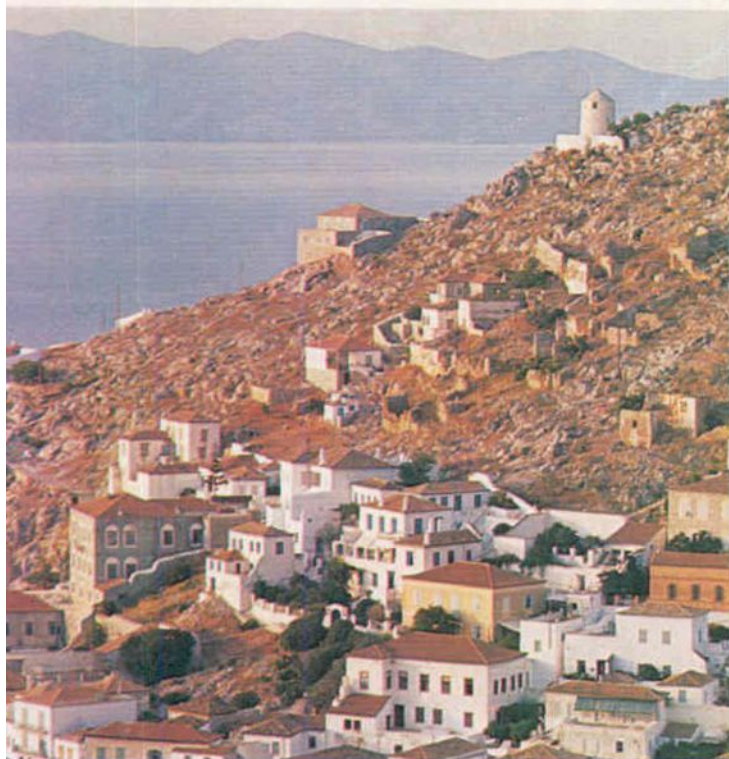
The sky

As seen from the ground, the daytime sky is a dome across which the sun and clouds appear to move. The blue colour of a clear sky is a result of scattering and selective absorption of sunlight by the atmosphere.

When objects are in shadow under a 'near sky, they will be lit mainly by skylight and will have a blue cast when photographed on colour film. The colour temperature of a clear blue sky is about 10,000 K. The saturation of the sky's blue tint is influenced by the amount of airborne dust and water vapour in the atmosphere. Over industrial cities, skies are rarely as deep a blue as they are over the countryside, where there are usually fewer airborne particles.

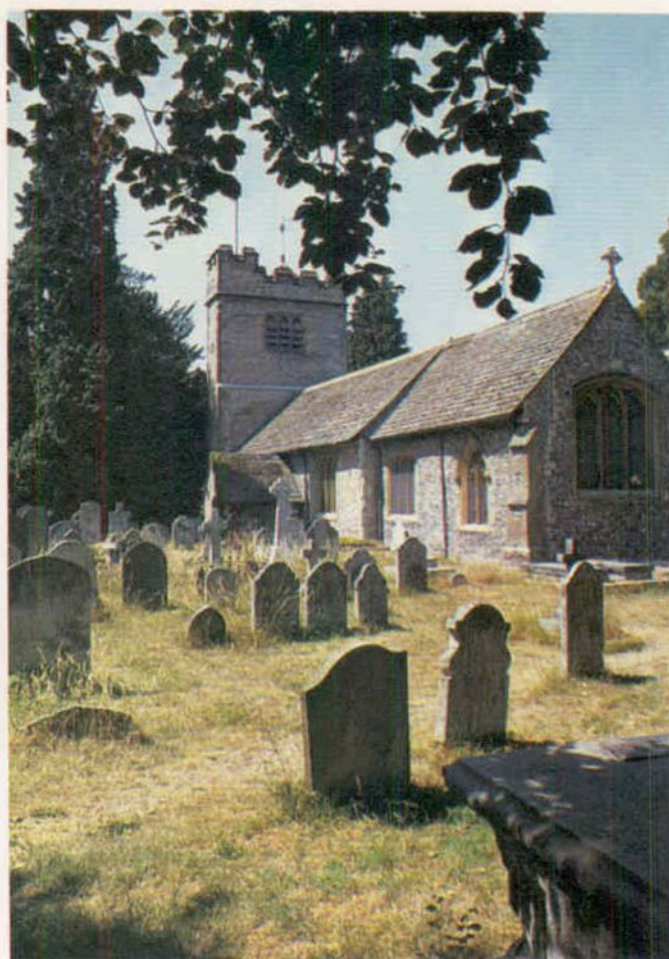
When the sky is a paler blue, shadows are less deep and pictures have less contrast because relatively more light comes from the sky. Pictures taken under





Harbour village *Light depends on atmospheric conditions. A slight haze lowers the contrast of the light, giving a timeless, dreamy quality*

Churchyard at noon *In the countryside during summer, midday light can produce deep shadows and high contrast. The effect is reduced in towns by air pollution*



Duncan Brown

such skies often have better shadow detail than those taken under bluer skies, while still retaining a sunny look. Yet because proportionally more skylight is falling on the subject you may need to use a yellowish 81 series filter to obtain natural looking colour photographs, even when your subject is not in shade.

The light from the sky is quite different when the weather is cloudy. At midday, the light falling on a subject from an overcast sky has a colour temperature of about 7,000 K, which is distinctly blueish. Without the direct rays of the sun the lighting is soft and shadowless, but may need an 81C filter for neutral colour balance. You should be careful not to over-correct colour temperatures, though. If your pictures combine completely neutral colour balance with grey, overcast skies they may not look natural. You expect to see slightly colder colours on dull days—they help to capture the mood of the scene.

A sunny day: dawn

Because the position of the sun has such a great influence on the quality of natural light, it is useful to follow the effects of the sun's position in the sky through an idealized sunny day.

Shortly before sunrise the sky begins to glow softly. How long it will glow depends on latitude and atmospheric conditions. At higher latitudes, the sun moves more obliquely towards the

horizon, and both sunrise and sunset take longer than in regions near the tropics. If the atmosphere contains many particles of fine dust and other contaminants, more light will be diffused up into the sky before sunrise and the dawn will be more protracted. Nevertheless, although the light reaching the landscape is essentially blue skylight, it is more directional than the skylight later in the day. Shadows are long but soft, because the light is coming from a low angle.

Photographically, early dawn twilight presents some problems. Even with high speed film, exposures are long. A tripod is usually necessary, and static subjects such as landscapes and buildings are more suitable than living subjects. Yet the cool blue tones of early morning can be very attractive, and you should not overlook the possibilities that an early start provides for photography. Large cities are usually almost deserted at this time of day and have a special mood not found at any other time. Interesting effects can be achieved in landscape photography, particularly of mountains: the reddish direct light of the sun will strike the peaks of the mountains while the rest of the landscape is still lit by the cool blueish light from the sky, creating interesting contrasts of brightness and colour.

As the sun rises above the horizon, the long shadows become hard-edged. If

the night has been clear, the air is clean and distant views have great clarity. Early sunlight has a lower colour temperature than later in the day. Contrasts between areas that are lit by sun and those in shadow are high, a difference accentuated by the coolness of shadows and the warm tone of the sunlight. Landscapes with long shadows and golden highlights look particularly effective. The strong contrasts give a greater appearance of sharpness.

Portraits taken at this time of day have strong modelling, and the colour of the sunlight is flattering to skin tones. If the contrast between shadow and sunlit parts of your subject is too strong for your taste, a reflector can be used to bounce some extra light into the shadows. Use a sheet of white card or a piece of aluminium foil stuck to a board.

Morning

As the sun rises higher in the sky, the balance between sunlight and skylight moves closer towards the norm for which the film is designed. The sun no longer has to shine obliquely through so much of the Earth's atmosphere, and its colour temperature increases. The sky brightens, and contrasts between shadows and sunlit areas lessen. Shadows shorten, but are still long enough to give interesting modelling to subjects. How high the sun will rise depends on the time of the year and the latitude, but in general, mid morning on



clear days gives a good all purpose light with excellent modelling and colour balance that is close enough to neutral not to need any corrective reddish or blueish filtration.

Noon

The sun is at its highest at noon. In the tropics the sun will rise to be directly overhead at certain times of the year. At such times, shadows are extremely short and the sun's light is very strong. Even at higher latitudes the light will have relatively high contrast with deep shadows, but the overall colour balance will be neutral.

If you are using colour slide film in high contrast conditions, it is usually best to give slightly too little exposure rather than too much. Pale, washed out highlights are less desirable than full shadow tones with richly coloured light areas. The bright light of noon gives good colours if you do not overexpose your film.

If the sun is very high in the sky, portraits can be unsatisfactory—deep shadows under the eyes and nose can obscure facial features. Once again, this is a time to use fill-in reflectors, either artificial or natural. A sandy beach can work well as a reflector, or you can move your subject under some trees to exploit the natural diffusing qualities of foliage. Colour balance in the shade of trees can be a problem—the blueish light of shade is mixed with green light filtered through leaves and may call for the use of a magenta colour compen-

Football crowd The warmth of late afternoon light can be extremely flattering to skin tones. But it can photograph redder than it appears

World Trade Center Afternoon sunlight highlights buildings while leaving the background relatively dark, especially in unsettled weather



David Overcash/Bruce Coleman Ltd

sating filter. A CC 10M is usually sufficient correction.

Afternoon

When the sun starts to drop in the sky, the modelling quality comes back into the light, as in the morning. Shadows lengthen again, but in the opposite direction to those cast in the morning. Subjects that were not lit the way you wanted in the morning may now be ready for you to photograph. When you photograph static subjects such as buildings and landscapes you should always pause to think how the changing direction of the sun's light will affect their appearance.

The skylight is usually paler in the afternoon, especially over cities where the day's activities stir dust and other particles into the atmosphere. Afternoon light is therefore generally warmer than at other times of day. Haze softens colours over distance, and this *aerial perspective* can give emphasis to the scale of city views and landscapes.

Sunset

At the end of the day, the sunlight again turns a golden yellow, as it was at dawn. Because of aerial haze, however, the colour is likely to be even redder than at dawn, and will be spread over a larger area of the sky. On completely clear days this effect may be disappointing—the most spectacular sunsets are those with some clouds in the sky to reflect the sunlight.

Light readings for sunsets should be

If morning light is flattering for portraits, that in the late afternoon and at sunset even more so. Golden skin tones, rich colours and contrasting deep blue skies in the background are easy to obtain. Your subject is often able to face the sun directly for flat but revealing lighting. The sunlight is weakened by atmospheric haze and does not make your subject screw up his or her eyes as much as in the morning.

Dusk

After the sun has dropped below the horizon, the remaining light from the sky has a very high colour temperature. Towards the sunset horizon there are usually some fast disappearing traces of pink and red in the sky, but the predominant colours are violets and blues. You need not attempt to correct colour temperature with filters at this time of day. The light changes so quickly in colour and intensity that even if you use an expensive colour temperature meter you are unlikely to be able to convert its readings into a corrective filter pack before the light changes.

If you have a tripod, colour film, and can work quickly, you can make photographs of cities and buildings at this time of day that capture the impression of night particularly effectively. There is still enough light in the sky to reveal the forms of buildings, but the interior lights glowing through the windows give pictures a night-time feel. The period in which the light from the sky and the light from windows is balanced is short. Set up your camera beforehand, use tungsten film to accentuate the blue of the sky, and make as many exposures as quickly as you can before the last of the day's light vanishes. Night photography is dealt with in a later article.

George Wright



Landscape As dusk settles, the colour of the light sinks towards the deep blue of night. Keep exposures short to avoid trailing of the Moon's image

City sunset Even when it is too dark for normal photography, light in the sky and windows can give good pictures of silhouetted buildings

taken from the brighter clouds rather than from the sun itself, but small changes in exposure can cause considerable differences in the final effect. It is difficult to photograph a sunset badly—if you see a particularly spectacular sunset, take several shots at different exposures. Most of them will be satisfactory in their own way.

Jerry Young





Telephoto lenses

There are many occasions when the image formed by a standard lens is simply not big enough. A telephoto gives a bigger, better picture

Jon Bouchier/lenses courtesy of Nikon, Pentax and Tamron



There is nothing more disappointing than developing a roll of film and then finding that the main subject occupies a tiny area in the middle of each picture. It is not therefore surprising to find that after buying an SLR and standard lens, many photographers buy a telephoto lens or a zoom, because a focal length longer than the standard 50 mm produces an enlarged image. This seems to bring the subject closer to the camera, and gives pictures of distant subjects more interest and impact.

Looking through a camera fitted with a telephoto lens is like looking through a telescope, and telephotos have many uses in the same kind of circumstances that demand a telescope or binoculars. For photographing sport or wildlife, or picking out faces in a crowd, telephoto lenses are essential.

There is, however, another use for a telephoto lens which is less obvious than the enlargement which it produces on the film. On some occasions, getting close enough to the subject is not really a problem—portraiture is an example—but there are advantages to be gained from moving back, and putting some space between the camera and subject.

Jon Bouchier/lenses courtesy of Pentax (UK) Ltd



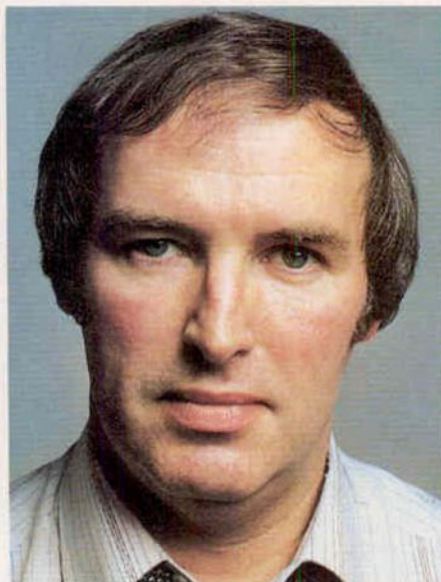
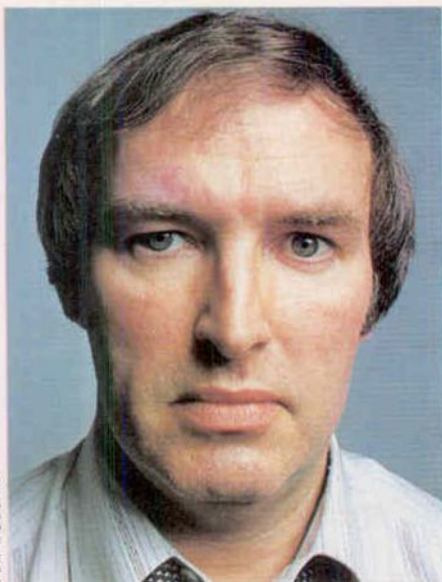
Lens hoods The contrast of many pictures can be improved by the use of a lens hood, but this is often not included in the basic price of a lens

Long lens choice All these lenses give an enlarged image on film. The smallest is little bigger than a standard lens

In order to fill the frame with a head and shoulders portrait, it is necessary to stand within about 60 cm of your subject when using a standard lens. Fitting a 105 mm lens enables you to move back to double this distance, and still get an image that is just as big. With a 200 mm lens, there will be nearly two and a half metres between you and your subject for the same image size.

Moving back from a portrait sitter can improve your pictures in two ways. First, by changing the perspective of the portrait, the nose of your sitter does not look so large in comparison to the rest of the head. Secondly, the sitter will be more relaxed; it is not easy to wear a serene expression when there is a camera a short distance from your face.

For both these reasons, most tightly cropped portraits look a lot better when shot on a long focus lens, and if you expect to be doing a lot of portrait work, it is worth considering buying one, even if you will have little use for it in other types of photography.



Portraits and telephotos The picture on the left was taken with a standard lens, and looks distorted because the photographer was so close to his subject. Using a 85 mm lens enabled him to move back, so the perspective is more pleasant

Telephoto or zoom?

At first glance, it may seem that zoom lenses offer better value than fixed focal length telephotos. Zooms have a range of different focal lengths: some of them range from wide angle, through standard 50 mm, to telephoto. But fixed focal length telephotos have retained their popularity for a number of reasons. The most important of these is performance. For a photographer who demands top quality, zoom lenses are often inadequate. Few, if any, zooms are as good as the best lenses of fixed focal length.

Fixed focal length lenses are cheaper than zooms, too, because the optical construction of a fixed telephoto is much less complex and costly to assemble. This is especially noticeable at the cheaper end of the lens range—cheap telephoto lenses often produce acceptable results, whereas cheap zooms are frequently very poor indeed. If you do not have a lot of money to spend on a lens, a fixed telephoto will usually produce better results than a zoom lens of the same price.

Zoom lenses tend to be much heavier, and more bulky than fixed focal length telephotos and although a zoom might cover the range of several telephotos, many photographers find that they habitually use only part of the range of a zoom lens. If, for example, you own a 80-200 mm zoom lens and only use the lens at its 200 mm lens setting, it would be much less cumbersome to carry only a 200 mm fixed lens.

The final reason why many photographers prefer fixed telephoto lenses is the maximum aperture available—some telephoto lenses have one or two stops more than their zoom equivalent.

Steep steps Telephoto lenses allow the photographer to move back, and this appears to compress depth and flatten out the subject

Few 80 to 200 mm zooms have maximum apertures wider than $f/3.5$, but an $f/2$ 135 mm lens is not unheard of. This means that photographs can be taken in dimmer light with the telephoto, or a faster shutter speed can be used.

Medium telephotos

The most popular focal lengths for telephotos range from about 85 mm to 200 mm. Anything shorter than 85 mm would not offer any significant advantage over a standard lens, and above 200 mm the weight and bulk of the lenses increases rapidly, and their maximum apertures are smaller. This means that, because of their bulk and weight, such lenses are hard to hold steady, and because their maximum aperture is smaller, a slower shutter speed is necessary. Consequently, lenses longer than 200 mm often need to be used on a tripod for best results. Such lenses are dealt with in a later article.

The most popular focal length in this range is the 135 mm lens. This is a useful all purpose telephoto which is usually



quite light and easy to hold, yet provides a convenient enlargement of about two and a half times compared to the image formed by a standard lens. It is perfectly suitable for portraits, and is not so long that you find yourself shouting instructions to your model, if you are taking portraits out of doors. For sport photography, or any picture where a larger image than normal is necessary, the 135 mm lens is a good compromise between lightness, compactness and high magnification.

Since there is so much demand for 135 mm lenses, economies of scale have brought prices down, and they are usually the cheapest telephoto in a manufacturer's range. The cheapest ones available cost no more than four rolls of process paid colour slide film.

Small telephotos

With the increasing popularity of compact 35 mm SLR cameras, there has been a swing towards smaller telephoto lenses, and this has frequently been achieved by simpler construction and so reduced size and weight. It has also meant that photographers have started buying shorter telephotos, such as the 85 mm and 105 mm focal lengths. These have long been popular among professional photographers, particularly photo-journalists. They eliminate the unflattering perspective that close working with a standard lens can produce when taking portraits, and are often available in wide apertures—typical examples include an $f/2.8$ 85 mm and an $f/2.5$ 105 mm.

Some photographers consider these focal lengths too short to be useful, but they are compact, and produce an image which is double the size of that formed by a standard lens—quite ample under many circumstances.

200 mm lenses are at the upper end of the medium telephoto category. They produce a magnification of about four times compared to a standard lens, and are very popular for sporting events where the crowd is quite close to the competitors. They would be useful for tennis, but not so useful for soccer if the football players were at the other end of the pitch. Here, a much more powerful lens, such as a 400 or 600 mm, would be better for covering the distances involved.

A 200 mm lens forces the photographer to stand quite a way back from the subject compared to the camera-to-subject distance for a standard lens. This



John Sims/Vision International

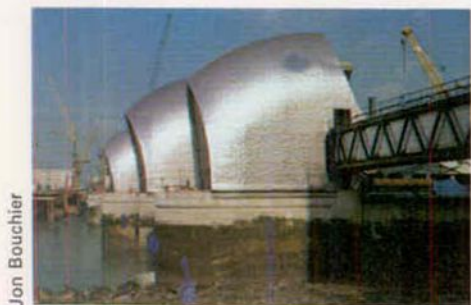
has the effect of compressing apparent perspective. A line of cars, for instance, appears packed tightly together when photographed with a 200 mm lens.

This 'compression effect' is what a lot of photographers look for in a telephoto, but it can have drawbacks. It also compresses dust and haze in the atmosphere, and photographs of distant scenes with a 200 mm lens are often spoilt because of this. The atmosphere is only clear enough to get really crisp results over long distances on a few clear, frosty winter mornings. Over shorter distances, haze in the atmosphere is less of a problem, and will only intrude in very hot, dusty weather. A 200 mm lens should be useable over distances of up to 200 metres on most days of the year, without atmospheric mistiness becoming objectionable.

Camera shake

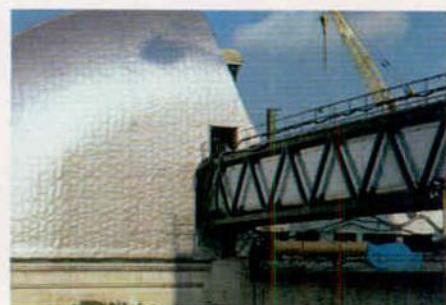
Just as a 200 mm lens magnifies the image four times compared to a standard lens, so also it emphasizes any camera shake by a factor of four. This means that faster shutter speeds are necessary if all camera movement is to be eliminated. A rough guide to the slowest shutter speed that can be used hand-held is that it is equal to the reciprocal of the focal length—a 50 mm lens can be hand-held at a $1/50$ sec, (nearest common equivalent $1/60$) a 135 mm at $1/135$ sec (approximately $1/125$) and a 200 mm lens at $1/200$ ($1/250$). This can be very limiting, and may force the photographer to use a fairly wide aperture if a tripod is not available.

This may in turn lead to problems of depth of field—when a 200 mm lens is focused on a point ten metres away,

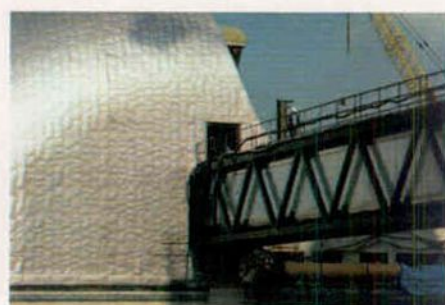


Jon Bouchier

Standard 50 mm lens



85 mm telephoto lens



105 mm telephoto lens



Roofs and houses Because a long focus lens includes less of the subject, it is possible to crop really tightly for striking, dramatic compositions

the depth of field is only 80 cm at an aperture of $f/4$.

This vicious circle—fast shutter speed needed to eliminate camera shake, so wider aperture selected, which in turn means inadequate depth of field—is shared by all telephoto lenses, not just the 200 mm. But the problems become more pronounced as focal length increases. The only real solution is to use either a tripod or a faster film.

The focal length of lens that will be most suitable for each individual photographer will largely be dictated by the type of photography for which he or she anticipates the lens will be used. For

most people, the actual view through the lens is the deciding factor. By looking through a range of telephotos, and pointing them at people in the shop or in the street outside, it should be easy to judge which lens is best fitted to your requirements. This is a subjective decision in the end, and as often as not, people will reject a lens because the viewfinder image is not 'right'.

Choosing a lens

The choice of focal length is usually fairly easy, but the problems arise when it becomes necessary to choose between many similar brands. Many of the comments about choosing lenses in the article on zoom lenses (see pages 60 to 64) apply equally to telephotos, but there are a few other points to consider.

All long focus lenses should be used with a lens hood to give best results. The size of hood required will vary according to the focal length of the lens—a hood for a 200 mm lens will be unsuitable for a 105 mm lens. The better lenses of 135 mm and longer have built-in hoods, and those that do not often have hoods included in the price. A lens hood is an essential accessory and it may add a significant amount to the cost of a lens if purchased separately.

Similar comments apply to lens cases. Some people never use them, but other people consider them vital for keeping equipment clean. If you want one, make sure it will not add to the price, or at least take this into account when comparing prices of lenses.

Filters

If you use filters frequently, it is a good idea to take a close look at the size of filter needed for the lens you are buying. A number of manufacturers have standardized the filter size of their lenses as far as is practically possible, and all of the commonly used focal lengths from any one of these manufacturers take the same size.

Although adapter rings are available if filter sizes are not compatible, it is much simpler to buy a lens that will take the same size filters as your standard lens.

A point which is often overlooked when buying a lens is the direction of movement of the focusing ring. Some lenses have a ring that must be turned clockwise to focus to infinity, others anticlockwise. It can be very dis-



A good case If you do not have a camera bag, check that the lens price includes a case. This lens has a case and strap

concerting to have to switch between the two systems, so check this, too, when you are looking at lenses.

Very cheap lenses often use a mechanism called a preset diaphragm to close the aperture from fully open to the working aperture. This eliminates all mechanical couplings between camera body and lens. Just before exposure, the photographer turns a ring, which looks identical to an automatic aperture setting ring. This closes the diaphragm, and comes to a halt at a point preset by the photographer. Although this system works perfectly well, it is very cumbersome and slow to use. Unless it is essential to buy the cheapest possible lens, it is worth spending the extra money and buying a lens with an automatic diaphragm.

The best lenses on the market are almost always expensive, and for most photographers it is necessary to strike a balance between cost and quality. Even if money is no object, compromise is sometimes necessary—the extra light gathering power of an $f/2$ lens may seem desirable, but has to be considered in the context of the extra weight of the lens when compared with an $f/3.5$ of the same focal length. Only the user of a lens can decide exactly what specification he or she requires, and how much such a lens is worth.



135 mm telephoto lens



200 mm telephoto lens

Silver cows This series of pictures shows the field of view through the most popular telephoto lenses. All the pictures are printed from the whole of the 35 mm frame, so that it is possible to make a size comparison between them. Perhaps surprisingly, the 85 mm lens, which many photographers dismiss as being too short for most purposes, actually produces a very useful degree of magnification. The longest lens, the 200 mm, allowed the photographer to emphasize a small area of the subject

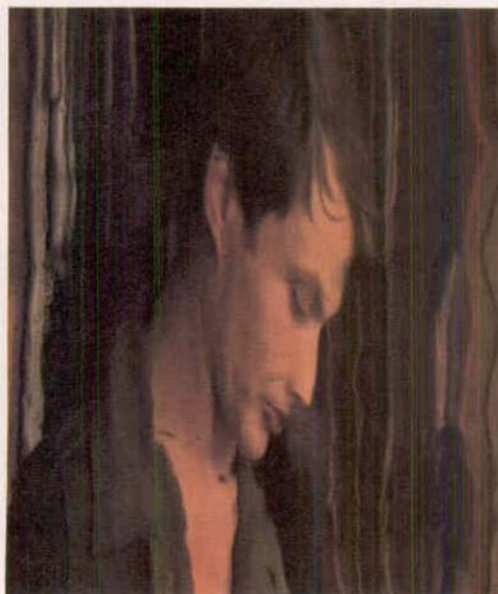
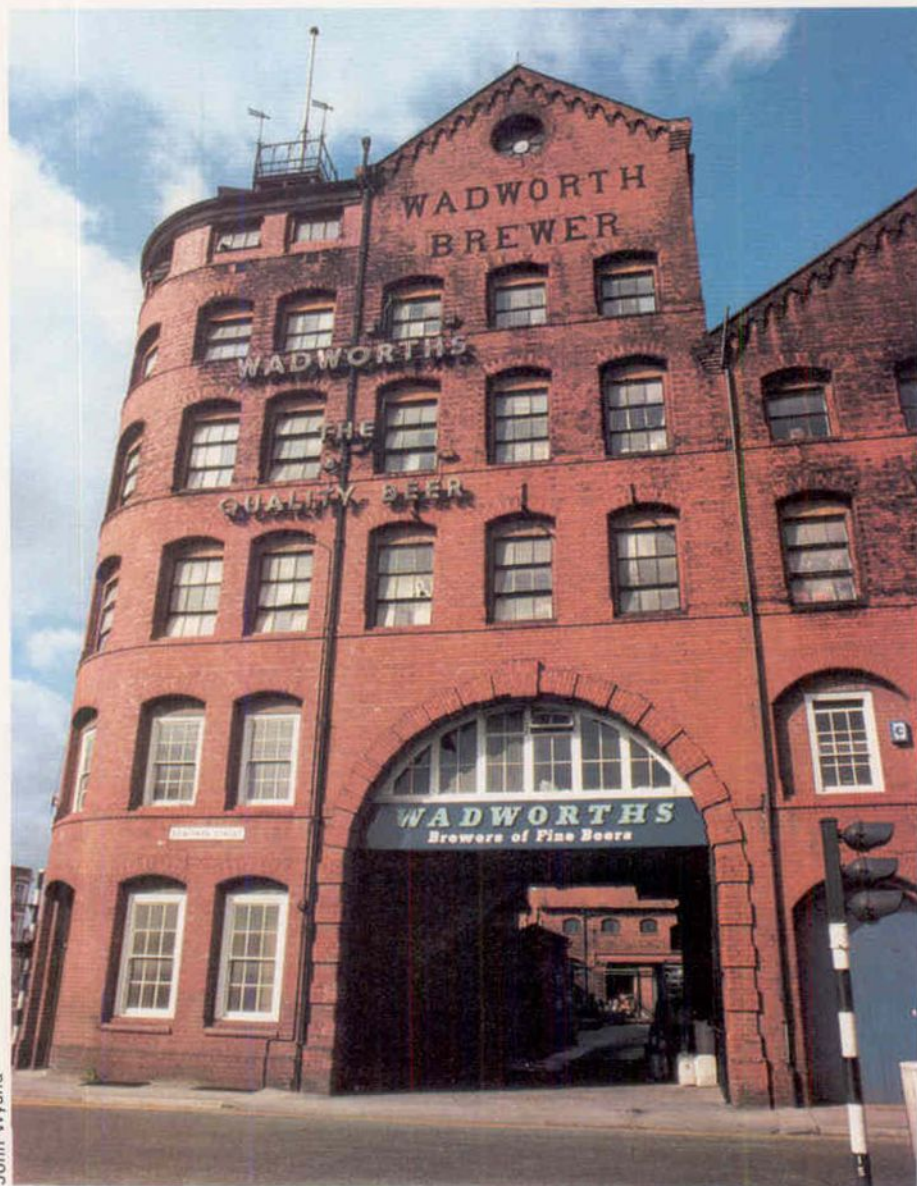
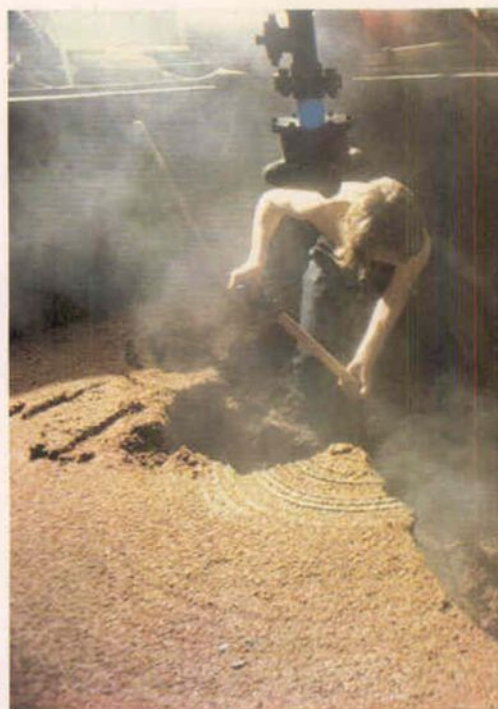
Country brewery

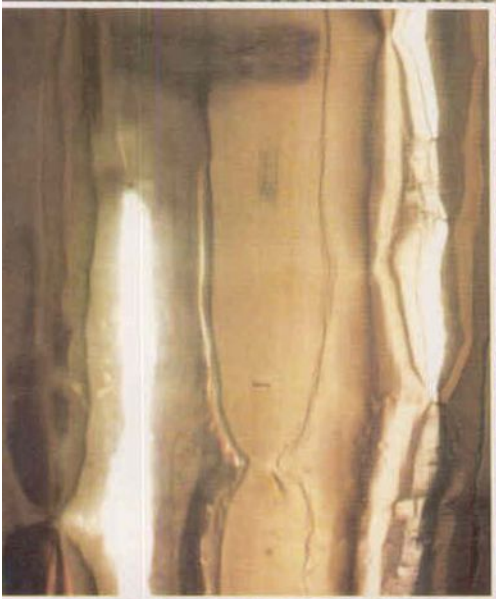
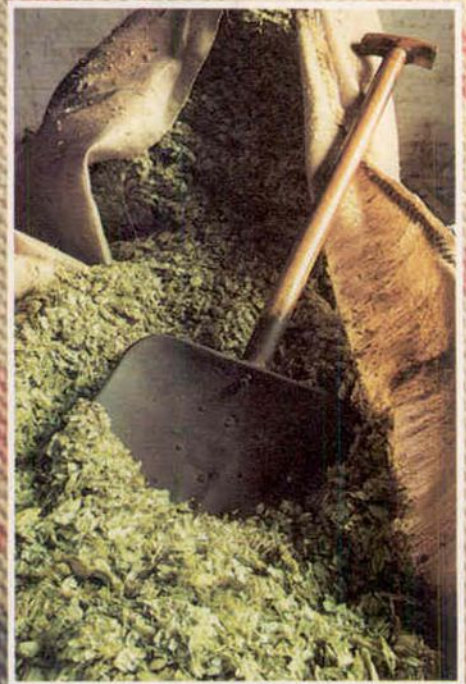
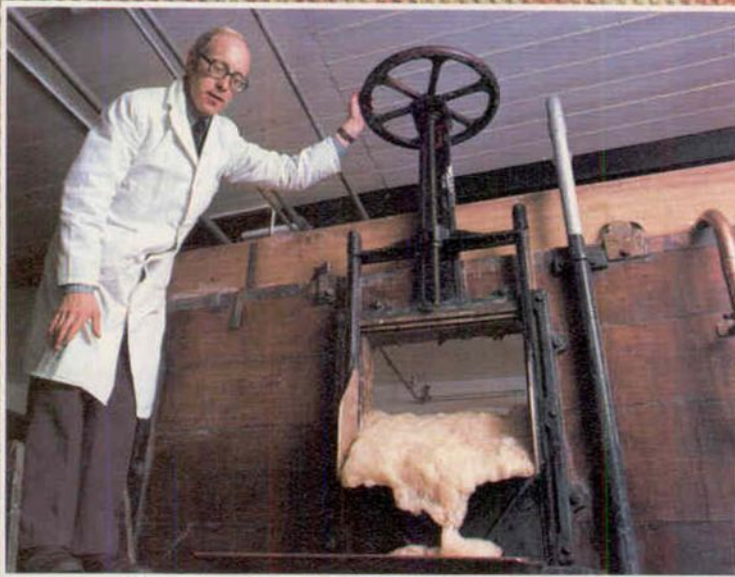
The products of country breweries have many devotees. And each brewery has its own individual character

Much of the atmosphere of a brewery is in its smell. This is impossible to capture on film, but Jon Wyand found there were many other ways of communicating the feel of a brewery. This series concentrates on the more pictorial aspects of the place.

The natural lighting in the old brewery —Wadsworth's brewery in Devizes, Wiltshire—was sufficient for Jon to dispense with a flash in most cases.

A day at the brewery Using available light for the most part, Jon Wyand chose to isolate subjects in simple, straightforward shots, taking interest in the detail and the viewpoint. Changing the lens added variety and an apparent change of perspective while composing through the lens saved wasting film and time spent in the darkroom cropping out unwanted objects and passers-by. He used a tripod and Kodachrome 64 film







Wall of barrels In this shot, which was toplit by a skylight, Jon made use of the only bright colour

Nuzzling horses Since a wide lens would have distorted their heads, Jon used a telephoto



'There were lots of small windows in odd places. The light was sometimes horizontal, or even from below. And rather than use a flash, it was possible to move things towards a window or door.'

Jon is well known for his landscapes and 'typical English' photographs. For this project, he took his usual complement of lenses: 24 mm, 35 mm, 55 mm macro, 85 mm, 135 mm, and 200 mm. He took only Kodachrome 64 film, and he used a tripod for all shots other than that of the horses.

The shot of the men shovelling in the enclosed mash tun and the one of the white-coated man turning a wheel above a chute of suds were the only times Jon used his electronic flash. The mash tun shot was lit using the flash with a metal reflector pointing through an opening Jon had made in the slats that normally cover the tun, and he shot it with a 24 mm lens.

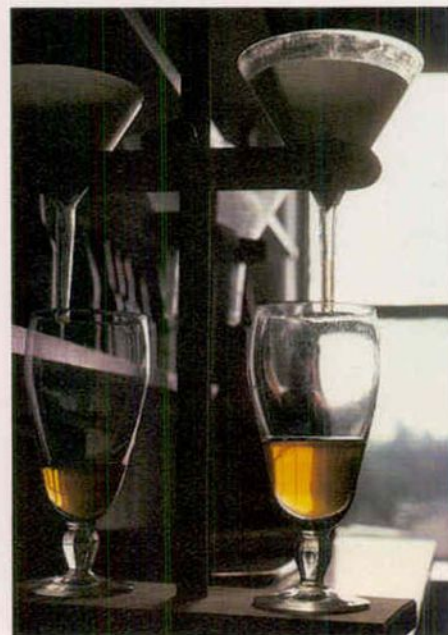
For the horses, he did not want to use a tripod as there was so much coming and going in the area, and he wanted to move freely. He chose his 85 mm or the 135 mm for these shots. 'You can get a nasty distortion of horses' noses with a wide angle lens—the noses are so huge!'

The beer funnelling down into two glasses was backlit. 'I used the window behind the beer to show the colour.'

Jon is a past master at composing through the lens, rather than cropping.

'I had to beware of pipes, and people appearing suddenly with wheelbarrows—the usual industrial bit.' He kept moving and looking for different viewpoints, or else changing his lenses to alter the apparent perspective. He also varied from detail shots to straightforward, workaday shots of the brewery and almost abstract photos of barrels stacked up three or four metres high against a wall.

Beer in glasses The beer is backlit by the window to show up the amber colour to best effect

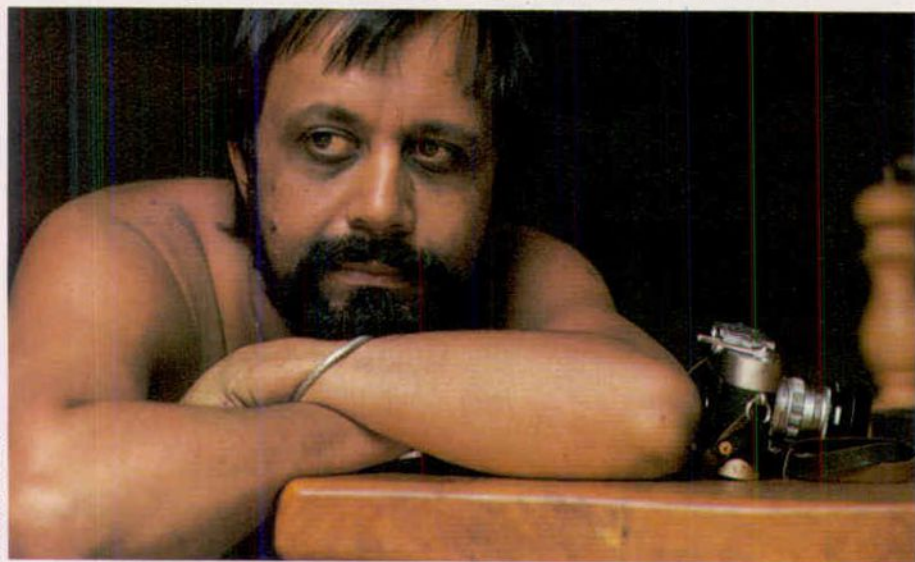




World of photography

Anwar Hussein

'The family have got to know me well now', says royal photographer Anwar Hussein. Yet on arrival in England in 1964 he was almost penniless



Anwar Hussein

Anwar Hussein spends his working life in the wake of the British Royal Family. Wherever they go, from Nepal to North Africa, Anwar is never more than a lens away. For he is one of the very few photographers who specialize in capturing the lives of the Royals on camera. It is a job that has taken him around the world, to places he had once only dreamed of, and which has given him a comfortable lifestyle with a town and a country home. Yet when he arrived in England from his native Tanzania, he had almost no working capital and no more than an interest in photography.

'I always wanted to be a pilot,' he confesses, 'but my parents were against it. They thought I was far too reckless to fly and refused to let me join the air force or have any flying lessons. So I left home and came to England with the idea of spending a year here to look around, gain experience and decide what I wanted to do with my life.'

'I knew nobody in London when I arrived on a cold, bleak November day. Within a short time I was ready to go home . . . only I couldn't afford the return fare! I couldn't get a job anywhere although I tried everything from a clerk to a bus conductor, and I couldn't find anywhere to live. I ran into a lot of racial discrimination—I'd phone and make an appointment to see a room, only to be told it had gone when the landlady took one look at me.'

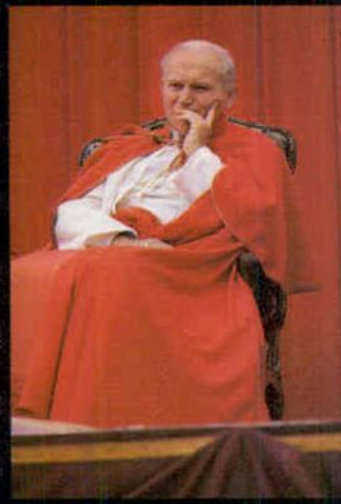
'I eventually managed to find a flat in Bayswater with the help of an Australian I met. He went with me to view the flat and the owner thought he wanted it. She was most surprised when I moved in next day with my bags, but by then she couldn't do much about it.'

His housing problem was solved, but Anwar still did not have a job. So he decided to try the only work he knew anything about—photography.

'It had always been my hobby,' he says, 'and I quite fancied myself as a photographer. I'd taken some pictures at home and got a portfolio together back in Tanzania, and I'd often helped my elder brother in his studio—he's a photographer in Kenya. So I decided to be a freelance, just like that!'

'I'd brought a Nikon and a Rolliflex with me from Kenya and I started by covering news stories, trying to be anywhere and everywhere. It was very hard work with little reward for a long time, and then things started to happen. I decided to cover a riot in Grosvenor Square in the mid-60s and arrived to find lots of action—and all the newspaper photographers there in full force. It hardly seemed worth bothering, but I decided that, as I was there, I might as well take a few pictures. In fact, I got

Images from Anwar Hussein's library:
the Queen, John Wayne, Margaret Thatcher and the Pope



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some good ones and sold quite a few to the papers, despite their own photographers being there.

'I began to get known and started adding fashion shots, pop and showbiz people to my workload. A couple of times I found myself working with a photographer who specialized in royalty. He told me how difficult and challenging his job could be and, as I like nothing better than a challenge, his words were like a magnet to me.

'The acting and pop world changes so often you've got to be really on the ball to get the pictures that are going to be

Arab dignitaries with the Queen in Kuwait during an entertainment by dancing girls. Hussein was crouching nearby with a 300 mm lens

Brass The Sultan of Oman's private band was passing the Queen when Hussein took this picture with a 300 mm telephoto lens



in demand and sell. And you waste so much time trying to set up sessions, only to have the subjects turn up late or cancel at the last minute. I was getting really fed up with the whole scene. I was also beginning to realize that it's much easier to specialize in one subject and the Royals seemed a good idea because there are very few photographers who concentrate on them.

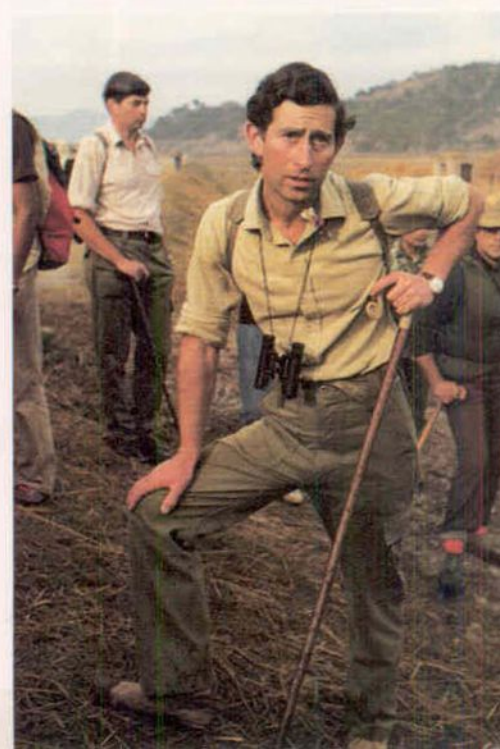
'I checked through my files and found I'd already got quite a batch of royal pictures I'd taken while covering general news stories. I organized them into the beginnings of a library, started covering every event which involved a member of the Royal Family and found my work was soon in demand. And all the time, my library of photographs was growing.

'My next step was to go on a Royal tour. I remained as unobtrusive as I could, didn't do anything to upset the family and seemed to be accepted. From there, it was a short step to getting commissions from magazines and news-

papers to cover these trips. It can be a very expensive business!

'I've done between 60 and 70 Royal trips, probably more than any other photographer, and paid for the lot myself. European tours are reasonably inexpensive, but when Charles visited India and Nepal it cost a fortune in fares and hotels alone. You can't book the cheap flights because you can't afford to be limited or restricted in any way. You've got to be able to move anywhere at any time and if something happens, or you want to fly on to another location in advance, you can't do so if you are booked on a charter flight. You just can't afford to take chances, so you book a straight ticket, which is also the most expensive! The Palace book accommodation for you and try to help where

Walking stick in hand, Prince Charles is pictured on an early morning walk to check a cross country course in Gloucestershire



they can. When I covered the Queen and Prince Philip's tour of Africa in 1977, I was given a place on the Queen's flight as they had some spare places. The same thing happened on her trip to Morocco.

'The family have got to know me well now. The Queen Mum sends me a signed Christmas card and she, the Queen and Prince Charles have all used my photographs for their Christmas cards. You really get to know them on tour as you are always invited for drinks at the British Embassy or on board *Britannia* for an evening that is totally off the record. When I was first introduced to the Queen on one of these evenings, I wasn't expecting it. I hadn't taken any formal clothes on the trip, so I was casually dressed and nervously sipping sherry at the Embassy when I noticed that everyone was queuing to go into another room. Naturally, I assumed it must be time for us to eat. Suddenly I found myself before the Queen, where I

photographs used in a *Sunday Times* book on the Silver Jubilee—the highest number used from one photographer. The books have made him some money. He is quick to point out that it is not an enormous sum but enough to help finance a few more trips.

'You have to keep reinvesting,' he explains. 'One of the drawbacks of this work is the expense, but because you have to keep your library stocked with fresh pictures, you have to go everywhere the family goes. Sometimes you have to cover a very ordinary event and just hope that someone, somewhere, will want to use a picture! A lot of my work is reproduced internationally—Germany is a big customer and fortunately their reproduction rates are high.

'Experience has taught me to photograph everything. When Charles went to India, I took a photograph of his labelled luggage piled up in the road. It sold very well. Once I wouldn't have bothered with the picture at all. I try to photograph as much of an occasion as I can, even the Queen's place setting before she sits down to dinner.'

The Queen's 'boys'

The Queen is a keen amateur photographer herself and her knowledge has often helped the press corps. Anwar caught an amusingly informal picture of the Queen in Canada in 1976 when she was posing for photographers with some of her ministers. The British press had stood back to let a nervous Canadian photographer take his pictures first and, when he had finished, everyone in the formal group started to move away, thinking it was all over. Everyone, that is, except the Queen, who immediately noticed that 'her boys' hadn't taken a single shot. Anwar got an animated

Kneeling royalty at the Badminton trials watch Princess Anne negotiating the water jump. The Queen also carries a camera

Cloth capped Prince Andrew A sporting shot of the Queen's youngest son clay pigeon shooting at Sealand. Hussein used Kodachrome film



Headscarfed head of state An expressive study of the Queen taken with a 180 mm lens in Windsor Great Park. Also taken on Kodachrome 64 film

picture of her insisting: 'They haven't taken their pictures yet!'

The organization involved for Anwar on one of these trips is remarkable. Besides flights and hotels, he has currency, visas and health regulations to take into account, not to mention all his equipment. He has no assistant and carries his camera gear himself—all 38 kilos of it!

'You have to be very fit,' he says. 'I use four or five Nikons and take a variety of lenses and masses of film with me. I try to cover for any eventuality, but in extremes of heat or cold it's never easy to tell when a film is going to be affected. I use Kodachrome mostly, with Ektachrome for pictures that need fast processing. My most useful piece of equipment is a motor drive, which helps me to take the maximum number of shots possible in the few seconds it takes the Queen to pass by.

'I always have all my cameras loaded and ready to shoot. You never know when one is going to seize up, and the Queen isn't going to repeat a handshake or a walkabout just because your camera jammed and you missed it!'

Although he does not have an official assistant, Anwar's wife Caroline helps enormously with filing and cataloguing his library of pictures, making his appointments and arrangements for him and dealing with his paperwork. Somehow, she fits it all in between bringing up their two sons, Samir (Sam), born in 1979, Zakir (Zak) born in December 1980, and running their two homes.

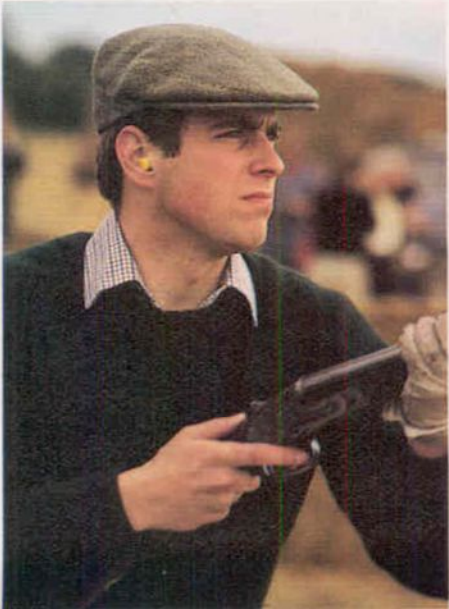
Anwar does not have a studio because he maintains that he does not need one. 'Most of my work is outdoors. I concentrate on that, so a studio just wouldn't get used. I used to do studio work a long time ago, but I don't like it. I don't like being limited to one room with artificial light—it's so contrived and static. I prefer to be outside working with different types of natural light and weather conditions—and you get plenty of those in

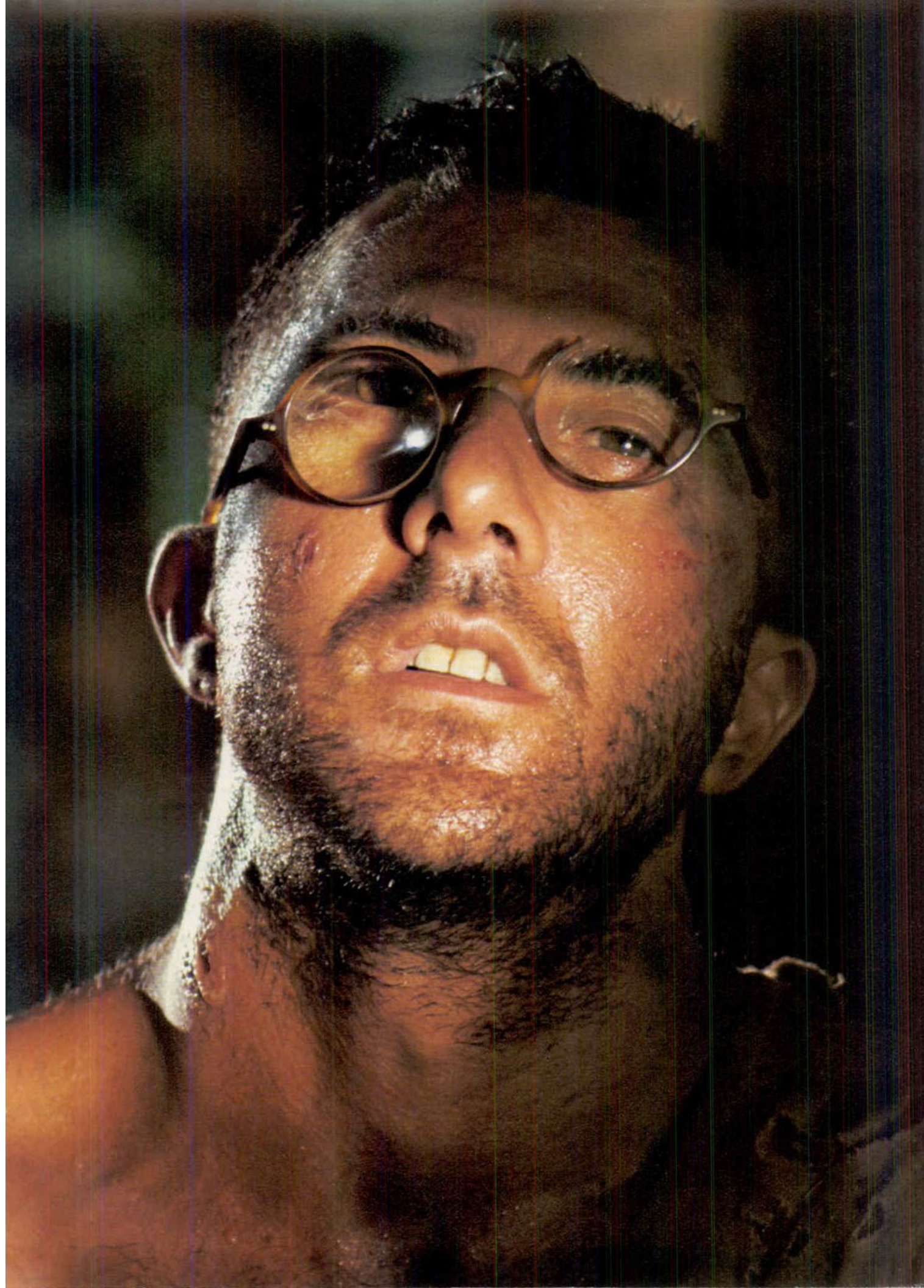


had to introduce myself as I wasn't wearing my name tag. Later she made a point of chatting to me for a while and putting me at my ease. Since then I've often enjoyed a conversation with her.'

For Anwar, one of the joys of his work is the travelling. 'It's wonderful,' he enthuses. 'You visit the most amazing places, ones that you wouldn't ordinarily even consider. During the Silver Jubilee I was the only photographer who went everywhere with the Queen. I covered thousands and thousands of miles... looking back, I don't know how I did it. It was sheer hard work, but seeing the Pacific Islands and the Caribbean made up for all that. Wherever I go, I make a point of photographing the local people, their colourful customs and dress. It's a bonus for me and I hope one day to produce a serious book of captioned pictures I've taken around the world.'

Anwar has already produced two books about Prince Charles and one on Prince Andrew. He also had 45 of his







Jane Fonda on the set of *The Electric Horseman*. The actress was relaxing between takes when Hussein caught her wide smile with a 105 mm lens

Dustin Hoffman during the shooting of *Papillon* in the West Indies. Hussein was commissioned to do the still for the film

England! If you can work outdoors here, you can work anywhere in the world.'

His favourite Royal to photograph is the Queen Mother, 'because she's so professional. She knows exactly what you want from her as soon as you point the camera in her direction. She doesn't mind the press, either. Prince Andrew is good, too. He's very easy going and enjoys having his picture taken.

'There's never been as much interest in photographing the Royal Family than there has been since the speculation about Prince Charles and his marriage plans came to a head. Now all the agencies and newspapers send photographers to anything that involves a Royal, even occasions when they know they'll be unwelcome. I try to avoid these events if I can.

'I've noticed that since the popular press started chasing Prince Charles

everywhere and quoting his off the cuff comments, blowing them up to headline proportions, he's become very wary. He used to be very friendly but he's changed and it's spoiling things for other photographers. We're all getting a bad name because of the fuss.'

Anwar's advice for would-be Royal photographers is tempered with the warning that his is not quite the glamorous or easy life most people believe it to be. 'That idea couldn't be further from the truth. The hours are long—you've got to arrive at a venue a couple of hours beforehand to set up—and the travelling is arduous. You have to start by checking the newspapers thoroughly for Royal calendar dates and making sure you get there. Apply to Buckingham Palace for any information they can let you have, and cover general events like Badmington and trooping the colour which are open to everyone. Get as many different and unusual pictures as you can, and catalogue them into a library. You've got to be prepared to spend money before you get any results!

'Some of the freelance photographers who specialize in covering the Royal Family are attempting to gain recognition alongside agencies and newspapers who get automatic rota passes and invitations. If they manage it, it will make life a lot easier for freelances doing this kind of work.'

Robert Redford as he appeared in the film *The Electric Horseman*. Shot between takes with a 105 mm lens

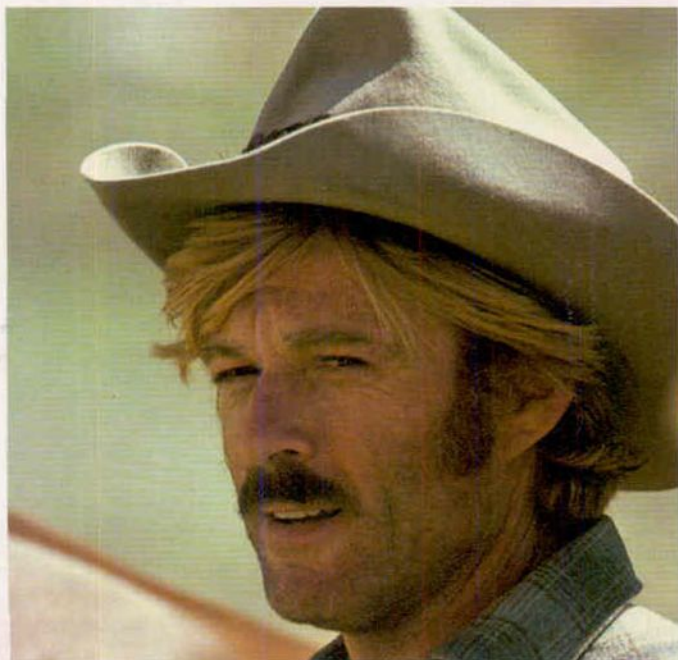
Reclining star Wide angle shot by available light. Mick Jagger posed for this just before a Vienna concert

Anwar's work is very much in demand but he accepts few commissions, preferring to decide for himself what he chooses to photograph, thus retaining control of the pictures. For three years running his work won the colour section of the Royal Photograph of the Year nominations. One winning photograph was an amusing shot of the Queen and Prince Charles, another was of Charles dressed as a Red Indian.

Anwar sees his future in books—serious ones, not the quickly put together books on royalty he has produced in the past. 'I'm not keen on writing, though. I'd much rather express myself in pictures,' he says.

'I've done all sorts of photography since my career started. I've even photographed wars while once working for the United Nations, and there's not really a branch of photography that I haven't tried. As long as I'm taking pictures, I'm happy. I never feel as if I'm working—it's just something that I love doing that also happens to make me a living.

'But photographing the Royal Family is my bread and butter. I'm in a privileged position now and I look on my work as recording history. I know people knock the Royal Family and what they do, but it is history and I'm helping to keep the records by capturing it on film. Forever, I hope.'

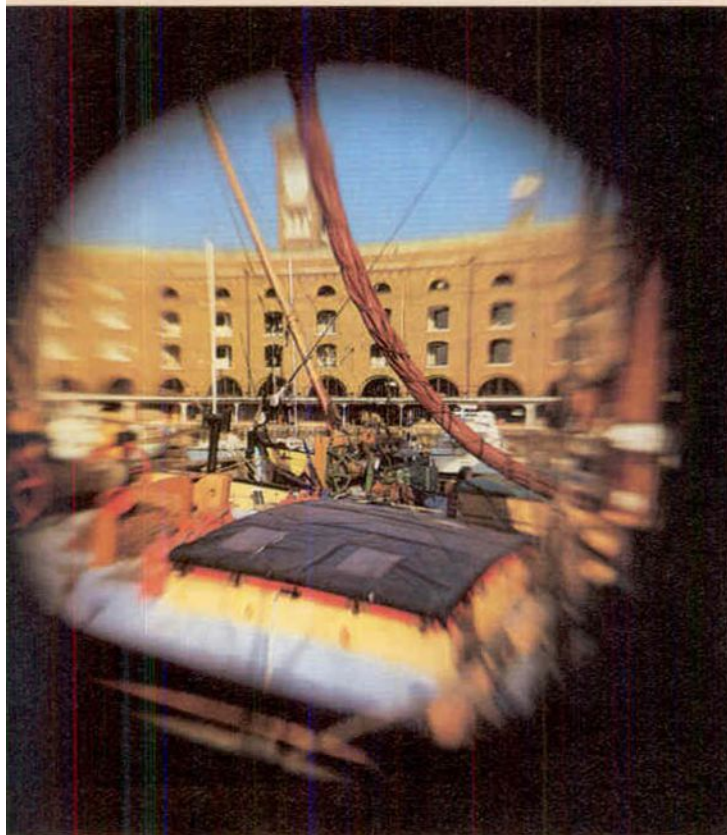


What the lens sees

Different lenses give different views of a subject—they can be used to make it bigger or to include a larger area, but they cannot change the perspective of the picture



Jon Bouchier



Dock scene A 90 mm lens designed for use with the large format camera which took this picture has enough covering power. The 90 mm lens for the lower shot was made for use with 35 mm film. The image is the same size, but only the middle is sharp and bright enough to use

The focal length of a lens is of vital importance because it influences the subject-image relationship in two principal ways. First, focal length governs the size of the image that an object forms on the film in the camera. Secondly, it governs the proportion of the subject that the camera 'sees'—that is, the angle of view.

Image size

If a series of 35 mm cameras with lenses of different focal lengths are lined up side by side, all pointing at the same distant subject, the size of the images on the screens will be different on each camera in the row.

For a distant object the dimensions of the image are proportional to focal length. A lens with long focal length gives a bigger image than a lens with short focal length.

A 500 mm lens gives an image of a distant church spire which is ten times higher than that produced by the standard 50 mm lens. Since the width of the image is also increased tenfold, then the total area of the image projected by the 500 mm lens is 100 times that produced by the 50 mm.

Angle of view

As focal length increases and the image grows bigger, less and less of the subject is included in the picture and the angle of view becomes smaller also.

If it is impossible to move a camera far enough away from a subject to include all of it with the standard 50 or 55 mm lens. Replacing the standard lens by a wide angle lens reduces the size of image and includes more of the subject on the film. A wide angle lens is really just a short focal length lens, because as focal length decreases the angle of view gets wider.

The angle of view of a lens depends not only on its focal length but also on the size of film with which it is used. It is usually measured along the diagonal of the film format, and the angle of view of some of the lenses commonly used on a 35 mm camera are shown in the diagram opposite.

Lenses and perspective

If a camera is set up and pointed at a subject such as a building with a figure in the foreground, exposures made from the same point with lenses of different focal lengths will show different angles of view, and different amounts of the subject will be included in the pictures. There will be no differences in perspective as long as the camera is not moved.

If, however, the camera is moved away from the subject each time a longer focal length lens is fitted—so that the figure in each picture is the same size, the perspective will seem flatter as the camera is moved farther away and the building will seem to get closer to the figure.



Close viewpoint Standing near to the subject and using a 28 mm lens results in pictures which seem to be distorted



Stepping back Moving away from the mother and child resulted in normal perspective. A standard lens was used to fill the frame



Long shot From a distance perspective seems flatter, but this was caused by the camera position not by the 105 mm lens used here

Standard lenses

The normal or standard lens for a 35 mm camera is one with a focal length of around 50 mm. This focal length gives a field of view roughly the same as that over which the eyes give satisfactory sharpness. You cannot, however, really compare a camera with the eyes because the angle through which the eyes give excellent sharpness is only a small proportion of the area we can actually see. Second, we can move eyes to scan a subject and also turn our heads. There is no magic in having a standard lens of 50 mm or so on a 35 mm camera. Many photographers claim that the wider angle of view of a 35 mm lens is preferable, while others maintain that a focal length of about 75 mm is better for general use because it enables the picture space to be filled more easily with the subject.

Telephoto lenses

A telephoto lens is essentially a lens with a long focal length, but it has a special construction that keeps the lens-to-film distance to a minimum. A basic long focal length lens must be placed one focal length away from the film if it is to form an image of a subject at infinity. In the case of a telephoto lens, the lens-to-film distance is considerably reduced so the lens can be made more compact.

With a 200 mm telephoto

lens the rear surface may be only 100 mm from the film when the lens is set at infinity. A long focal length lens designed for use on a large format technical or view camera is normally of conventional construction, but small format cameras normally use telephotos.

Retrofocus lenses

A short focus wide angle lens presents problems when used on a single lens reflex camera—as before, to focus on infinity, any lens must be one focal length from the film. If the lens has a focal length of 24 mm, it must be exactly this distance from

the film when photographing a distance object. For a single lens reflex camera to operate normally, however, there must be sufficient space for a mirror to be fitted in between the rear of the lens, and the film. 24 mm is not enough of a gap.

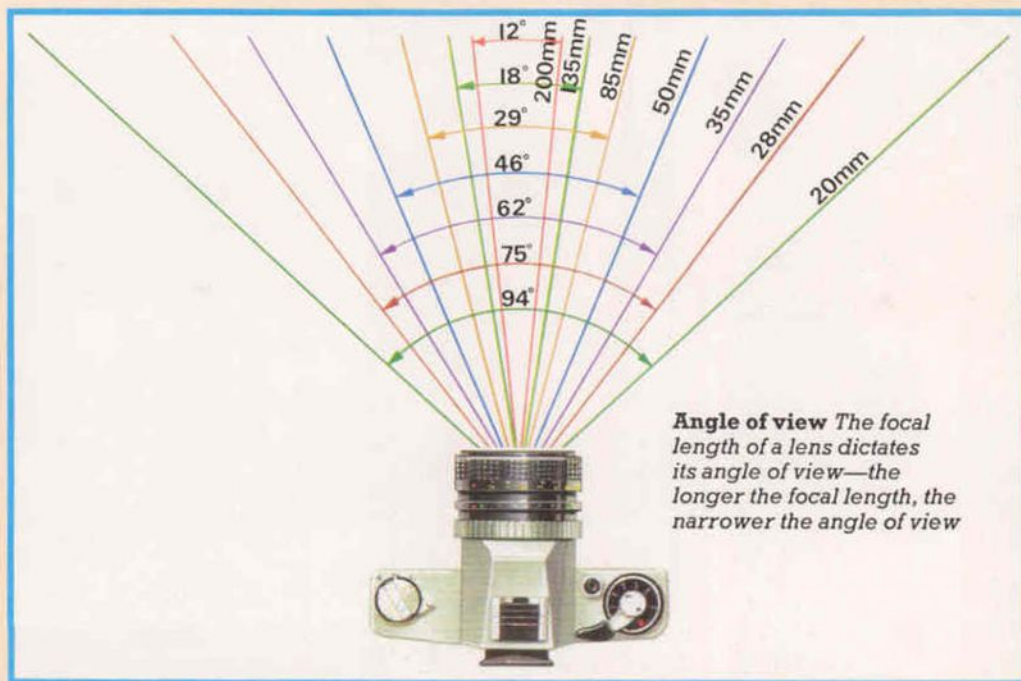
This difficulty is overcome by using an inverted telephoto or *retrofocus* construction which makes the lens-to-film distance much longer than the focal length, even when the camera is focused at infinity. In the case of a typical 24 mm wide angle lens the lens-to-film distance may be as much as 35 mm measured from the

rear surface of the lens. Some standard 50 and 55 mm lenses are of retrofocus type, as are many of the lenses in the Nikon range.

Covering power

If any lens designed for use on a 35 mm camera is mounted on a 4 × 5 inch technical camera and focused on a distant scene, the focusing screen of the camera will show a circular image, about 50 mm in diameter, the edge of which fades off into darkness. This circular image will just cover the 24 × 36 mm frame with an image which is evenly illuminated and sharp overall. Such a lens has a *covering power* adequate for a 35 mm camera but for nothing bigger than this format.

A lens with a focal length of 90 mm would be a telephoto lens on a 35 mm Leica, a standard lens on a 6 × 6 cm Mamiyaflex and a wide angle lens on a 4 × 5 inch Sinar technical camera. A 90 mm lens for a Leica needs only modest covering power relative to its focal length. The same focal length for a 6 × 6 cm camera would need normal covering power, but a 90 mm lens as a wide angle lens for the 4 × 5 inch format would have to be designed to give a much bigger image. The same 90 mm lens would not serve all three purposes equally well, so each camera format needs a separate lens to give best results.





Darkroom

Making better prints-1

Many irksome problems can crop up when you start printing. These must be identified and eliminated or you risk wasting the full potential of your negatives

However good your negatives are, you cannot produce high quality photographs unless your printing technique is equally good. So once you have mastered the basics, it is time to take a hard, critical look at your work to see if there are any improvements that you can make.

Your pictures should be sharp, free of spots, stains, drying marks or other blemishes, and have a good range of tones. It is not always easy to appreciate when your prints are sub-standard: the quality of photographs reproduced in books and magazines is no guide to the standard that a good original print can reach. You should go to photographic

exhibitions and the shows put on by camera clubs to learn how good a photograph can be.

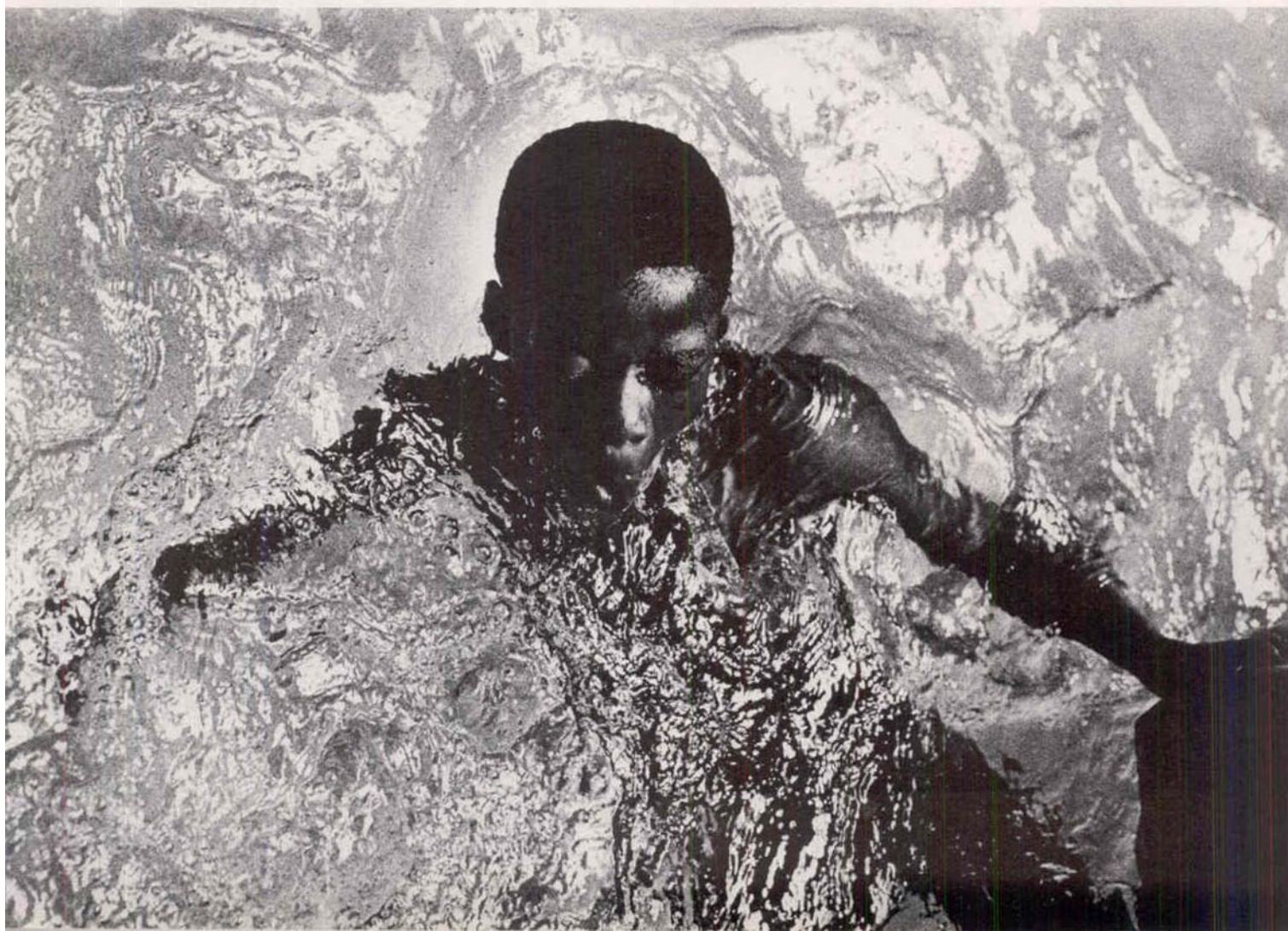
Once you have decided that your pictures need improvement, the next step is to identify which parts of your technique most urgently need working on. Trying to cure more than one defect at a time is difficult and can be confusing. Aim to improve one aspect of your printing technique each time you have a darkroom session.

Sharpness

Your pictures can lose sharpness either at the taking stage, or when you come to print your negatives. Causes of unsharp-

ness in the negative are usually the result of poor camera technique. To tell the difference between unsharpness caused in the camera and that caused at the printing stage, examine the highlights and shadows of your print. In general, unsharpness in the camera will make the image highlights spread into middle and shadow tones. Unsharpness caused in enlarging looks more gloomy. The shadows are spread into the lighter tones, and the print usually looks greyer.

A perfect print *A properly exposed and processed negative should print without difficulty. Sharp focus and print 'sparkle' are vital ingredients*



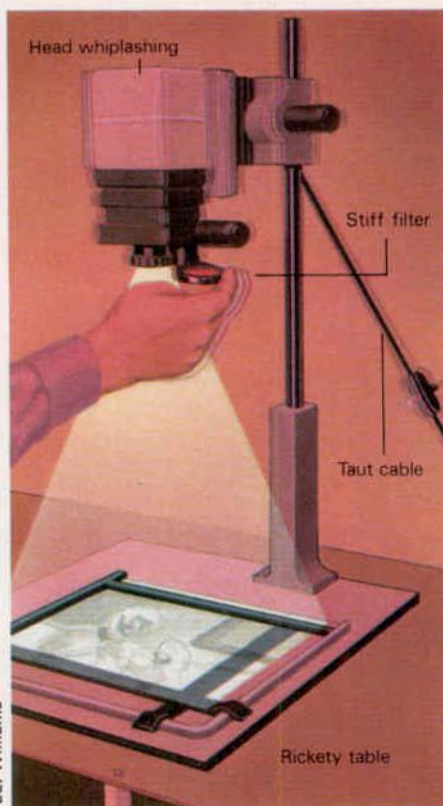
If your prints suffer from lack of sharpness, it may be that your enlarger vibrates. The columns of many less expensive enlargers do not hold the enlarger head steady enough especially when the head is taken to the top of the column for big enlargements.

To avoid this problem, try to touch the enlarger as little as possible when you make the printing exposure. Rather than beginning and ending exposures by swinging the red safety filter aside, block the beam of light by placing your hand between the lens and the paper. Then swing the safety filter aside, pause for a moment to allow vibrations to settle, and start the exposure by removing your hand without touching any part of the enlarger. You may find it easier to use a piece of opaque card to block the beam. If you use a conventional on/off switch to give exposures, make sure the wire does not cause a 'whiplash' effect, especially when the enlarger head is raised for big enlargements.

A more convenient answer is to buy an enlarger timer and set this up far enough away from the enlarger to prevent any vibration from reaching the equipment during exposure. A timer also ensures better exposure consistency as well as leaving your hands free for other jobs such as dodging.

If your darkroom is near a busy road or a railway line, vibrations from passing traffic or trains can be transmitted through the foundations of your house to your enlarger. This can be a considerable problem. Printing at night when there is less traffic can help. Or you can set your enlarger up on a sturdy bench resting on small rubber feet to dampen out vibration. You may need to set up your darkroom in a part of the house that suffers less from transmitted vibration.

No matter how rigid your enlarger is, take precautions to avoid vibrations caused in its use—do not touch the enlarger or work bench during printing



Paul Williams

exposures, and do not move around the darkroom unnecessarily if your floor-boarding is at all suspect.

Another cause of overall unsharpness is poor focusing. It can be difficult with the unaided eye to focus the image projected by an enlarger. It is much better to use a focusing aid that lets you see a magnified image of the negative grain as you adjust the enlarger. These inexpensive devices are well worth including in your basic darkroom outfit.

Some enlargers incorporate optical focusing aids that work by projecting a line or coloured spot on the enlarger baseboard. These are not usually very reliable, and it is better to use a separate focusing aid. Other, usually more expensive, enlargers incorporate automatic focusing linkages that are intended to set the correct focus for a range of magnifications. These can work well, but if the linkage is old and worn they may automatically set the image slightly out of focus at all magnifications. Automatic focus enlargers only work properly with the lenses supplied, and they must also be adjusted to allow for the height of the masking frame you use to hold the printing paper.

If your prints are only partially unsharp, your enlarger may be misaligned. The negative carrier, the lens panel and the baseboard should all be parallel to each other. If they are not, one side of your print will be noticeably less sharp than the other. You can check the alignment of your enlarger with a small spirit level; check that negative carrier, lens mount and baseboard are parallel in both front to back and side to side directions. If your enlarger allows you to change the alignment of these parts to



Gwendoline Patmore

Enlarger vibration Take care not to encourage vibrations of the enlarger head during printing. Vibration or jogging causes loss of sharpness and multiple images

correct perspective distortion, it will usually have set stops that mark the positions they should be returned to. Make sure that these stops work properly and allow you to return the carrier and panel accurately after use.

A related problem is looseness or play in the enlarger controls. Ideally, focusing and height adjustment controls should stay precisely where they are set without any looseness or wobbling. If they do not, the enlarger may shift slightly when you remove your hand from the control knob. This can spoil sharp focusing and also increase the effect of vibration.



Light scatter Use masks to cut out all light scatter and prevent the image from being affected by stray light



Paul Williams

Sharp focus If you have difficulty in focusing, a focus finder device may be just what you need



James Ravillions/Beaford Archive

Sometimes local unsharpness can be caused by the negative popping out of focus under the heat of the enlarger lamp. If this happens you will need to fit a different negative carrier, or a less powerful lamp, or a heat absorbing glass filter between the lamp and the negative carrier. This problem usually only occurs in enlargers fitted with condenser light sources and only with those which use glassless negative carriers.

Nearly all masking frames hold a sheet of printing paper sufficiently flat for the projected image to be sharp—the depth of focus of the enlarger lens when it is stopped down to the exposing aperture takes care of minor discrepancies. Some non-adjustable single paper size easels, however, do not hold the paper completely flat at the edges. This can alter the geometry of the image on the print, making straight lines near the edges of the picture curve noticeably.

Lens quality

A good enlarging lens is essential if you want to make top quality prints. If your pictures are less than perfectly sharp after you have checked for vibration, proper focusing and alignment, then you should take a closer look at your enlarging lens.

Stray light Even some of the most costly enlargers are not completely light-tight. You can cut down the serious reflection near the enlarger by taping black card to the wall behind the enlarger

First you must make sure that you are using the lens properly. Even expensive enlarging lenses do not perform at their best if they are used at maximum aperture. Close the lens down a stop or two for improved sharpness.

Dirt on the enlarger lens is yet another cause of reduced sharpness and contrast. You should always clean your lens before use with a soft brush and photographic lens tissue. Under warm and humid conditions mould may grow on the surfaces of internal lens elements. If this happens your lens will need to be professionally dismantled and cleaned. So try not to leave the lens on the enlarger between printing sessions—always store it in a dry, dust-free place.

If these precautions do not help, then you may have a poor lens. The lenses that are included in the price of many

Biting sharpness A print which shows good sharpness and accurate tones is always well received

inexpensive enlargers are often of low quality. In addition to causing a loss of sharpness, such a lens may also give uneven illumination of the projected image. This can make the centre of the print darker than the corners, although there may be another cause: many condenser enlargers give uneven illumination if they are not matched to the condensers, or if the condensers are not properly aligned with the enlarger lamp. But whatever the cause of your sharpness and image illumination problems, you should try to buy the best enlarging lens you can afford. A good lens on an inexpensive enlarger usually gives much better prints than a poor lens on an expensive enlarger.

How to prevent dust spots

The most annoying detraction from the quality of your black and white prints is dust. If your prints have a good range of tones and a clear, sharp image, viewers tend to 'look through' your prints and concentrate their attention on the subject you have photographed. A sprinkling of tiny white dust stops and hairs over the image automatically reminds your viewers that they are looking at just a piece of paper with a picture on it. You can retouch dust spots on your prints with special dye or water-colours, but it is much better to eliminate the problem at its source.



Advertising Arts

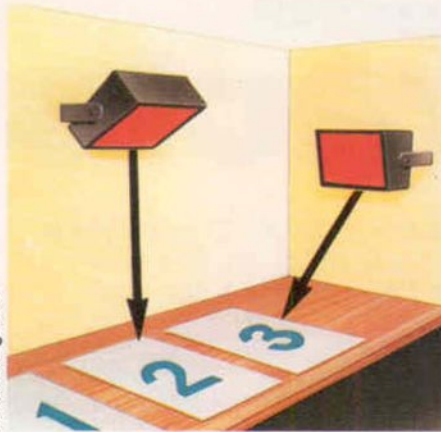
Your darkroom must be really clean. Vacuum clean the darkroom and the enlarger regularly to prevent dust from accumulating. Keep a plastic dust cover over the enlarger when it is not in use. Your negatives should be stored in proper filing sheets or negative envelopes, handled only by their edges, and never left lying about.

Before you make a print, switch on your enlarger and hold the negative obliquely in the projected beam so that you can see if there are any specks of dust on the surface. If there are, flick them off with a soft, dry brush. Sometimes dust specks cling to negatives. If this happens, they can often be removed with the help of an *antistatic pistol*. Another useful accessory is a can of compressed air to blow away dust. Special blower brushes are also available, but the brushes on these tend to become dirty. It is better to use a separate brush washed occasionally with water and a little wetting agent, then rinsed and allowed to dry.

If your darkroom is a temporary set-up in a room that is used for another purpose, you can expect more problems with dust than would find in a permanent darkroom. Try to set your darkroom up in a room with a minimum of clutter, and preferably without carpets or thick upholstered furniture and curtains. Bedrooms, for example, are less suitable than kitchens or bathrooms.

Safelight levels

If your prints have grey highlights, this usually means that your paper is being fogged—although severe overdevelopment and insufficient fixing can each appear similar. If you can count out processing errors, fogging is being



Safelighting Check that your dishes are positioned no closer than the recommended distance from the safelighting or fogging will result

caused either by light leaking into your darkroom from outside, or by a safelight that is not truly safe. In fact, given enough time and intensity, any safelight will fog paper. For this reason, safelight manufacturers give recommendations for the minimum distance from the paper at which their products should be used, and the brightest bulbs with which they should be fitted. Remember also that the filters in safelights fade with time, and eventually need to be replaced.

You can test whether your safelights are really safe. Place a piece of printing paper on your enlarger baseboard with your safelight turned on and a piece of opaque card covering one half. Estimate how long it usually takes to remove a piece of paper from its box, make a printing exposure, develop and fix the print. Leave your test piece of paper on



the enlarger baseboard for at least twice this time, then use it to make a print. If, when the print is processed you can see any difference at all between the half of the sheet that was covered with card and the half that was not, then lighting in your darkroom is not safe.

Another test is to place a coin (or any other solid object) on a test piece for the same duration under safelighting alone. Develop and fix this normally, and afterwards check for any image, the presence of which indicates unsafe darkroom lighting. You can test the safety period of using the red swing filter of your enlarger by either method.

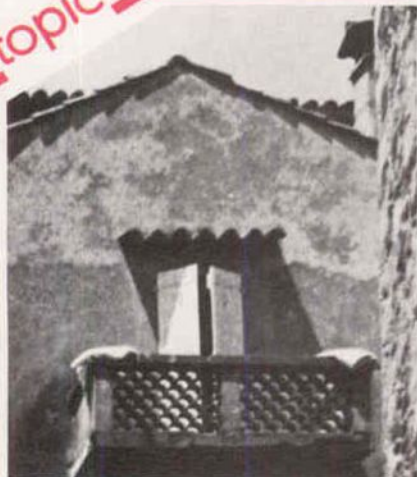
Repeat the test from time to time if your safelight uses a gelatin-glass type filter, and whenever you fit a replacement bulb and are not sure that its power rating is within the manufacturer's recommendations. Under no circumstances use a bulb which is too powerful as this is a safety risk.

Paradoxically, darkrooms should usually be well lit. The level of lighting should be bright enough to let you see what you are doing and avoid fumbling. Walls should be a light colour to make the most of available illumination. However, there are some exceptions. Many enlargers spill light from ventilation slots and other openings in the lamp-house, and if this stray light strikes the printing paper during exposure fogging may result.

A sheet of black paper taped to the wall behind the enlarger and to the ceiling directly above can cut down these stray reflections. An additional precaution is to keep shiny objects away from the enlarger baseboard during exposure.

Once you have made sure that your enlarger gives completely sharp results, and you have ensured that not even a speck of dust can affect your prints, and all sources of fogging have been eliminated, you can begin to work on your processing technique. The second part of this article shows you how to avoid faults in developing, fixing, washing and finishing.

topic



Enlarger lens quality

The lens is arguably the single most important piece of enlarging equipment. Its quality should at least be equal to your camera lens if you are to get good quality results. Buy the best you can afford. If you have to start off with a fairly cheap one, make its replacement a priority—especially if you intend later to do colour printing. If in doubt stick to lenses which

have modest maximum apertures of around f4 or f5.6, though wider apertures make focusing easier. Stopping a lens down for use improves frame sharpness and helps eliminate some lens faults. Check the image grain at the corner of your prints for sharpness. A cheap lens may give results such as shown to the left, while a good lens should give crisp detail to the edge of the print (right).



Creative approach

Abstracts

After taking pains to make your photographs look realistic it is refreshing to look at things in a different light and out of their usual context

Photographers usually spend most of their time trying to achieve the best lighting conditions and angle of view to make three-dimensional subjects look as realistic as possible in a two dimensional format. The attraction of abstract photography is that you can forget about conventions and the experience of the 'expert' on matters such as scale, depth,

lighting and viewpoint and, for once, let your imagination run riot on virtually any subject. You have the freedom to take a familiar object out of its normal context and completely disguise its identity—turning it into a two-dimensional pattern of shapes and colours. In this type of photographic exercise, there are no strict rules for you to follow because

abstracts are not pictures of subjects as you normally see them. They rely purely on the strength of the design within the picture frame to be successful. They are pictures in their own right and, as the subject itself is irrelevant, provide the photographer with an inexhaustible source of material. They do not rely on interesting subjects for impact—instead presentation is the key, and this relies on your own ability to spot and arrange things within the frame. The picture is entirely the photographer's creation and the real world simply acts as a quarry for material.

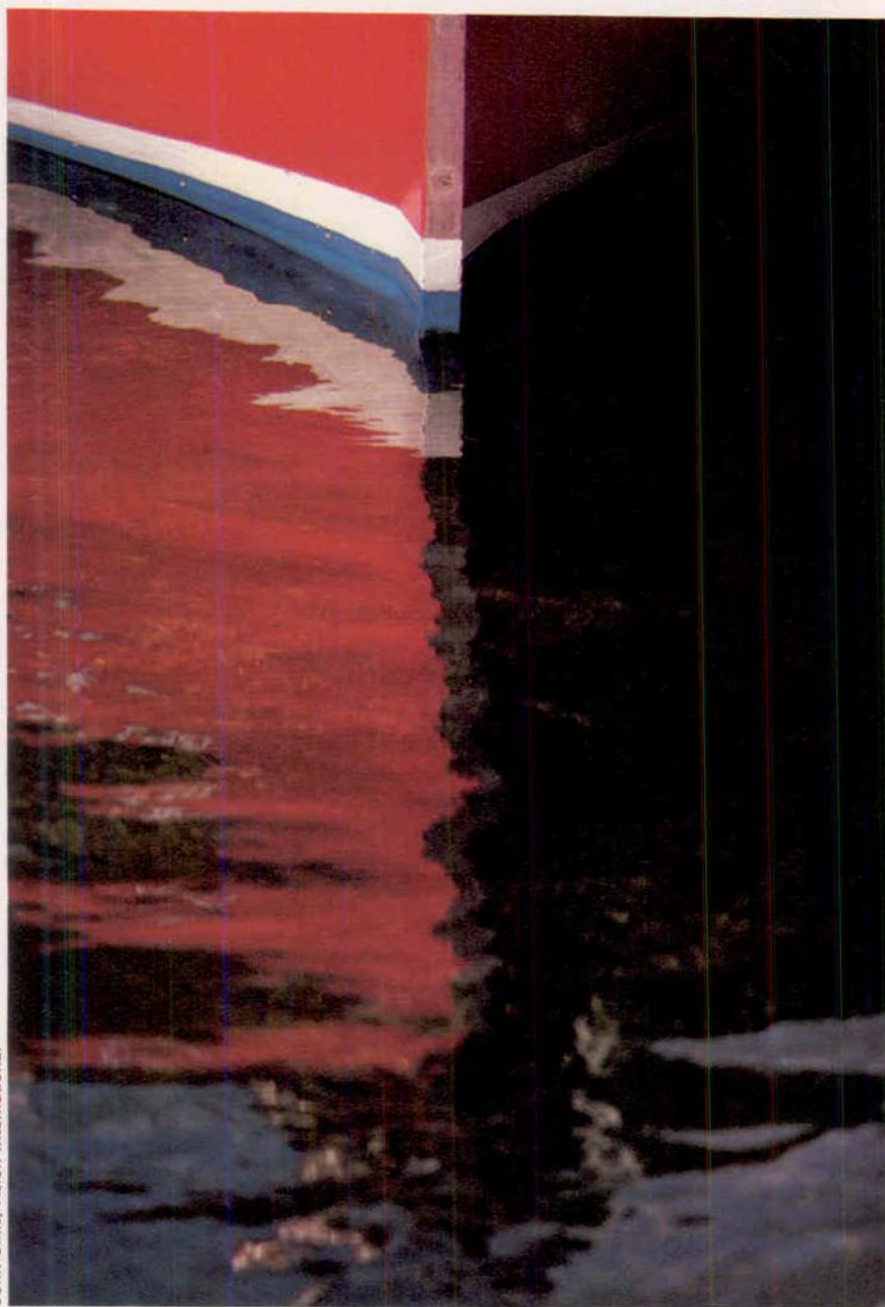
Think of the viewfinder as a rectangle with fixed, distinct boundaries and use it to isolate a subject from its surroundings. When you first start to look for abstract subjects, you may find it helpful to cut out a frame from stiff card. If you own a 35 mm camera, the longest side of the frame's inside edge should be $1\frac{1}{2}$ times longer than the shortest side (6×4 cm for example). Hold the frame up and use it to isolate one small area of an object. Move the frame around, change the viewing angle, move close to and far away from the object, each time concentrating only on what you can see in the viewfinder and noticing the effects on the objects. If it is small enough, move the object around and watch how changes in lighting affect the positions of shadows. As you look through your 'viewfinder', imagine that the world is two-dimensional. Experiment with different viewpoints; look up at things you normally look down on and vice versa. View at eye level those things you normally see from above or below. Try and see different perspective and forget about the 'normal' appearance of the object.

A good starting point for discovering an abstract slant on a familiar subject is to attempt to concentrate on just one of the main components that normally make up any object—shape, form, texture—so that certain parts, or features of it, appear to stand out. Squinting through nearly closed eyes may help you see your subjects in a different way and help you find abstract shots.

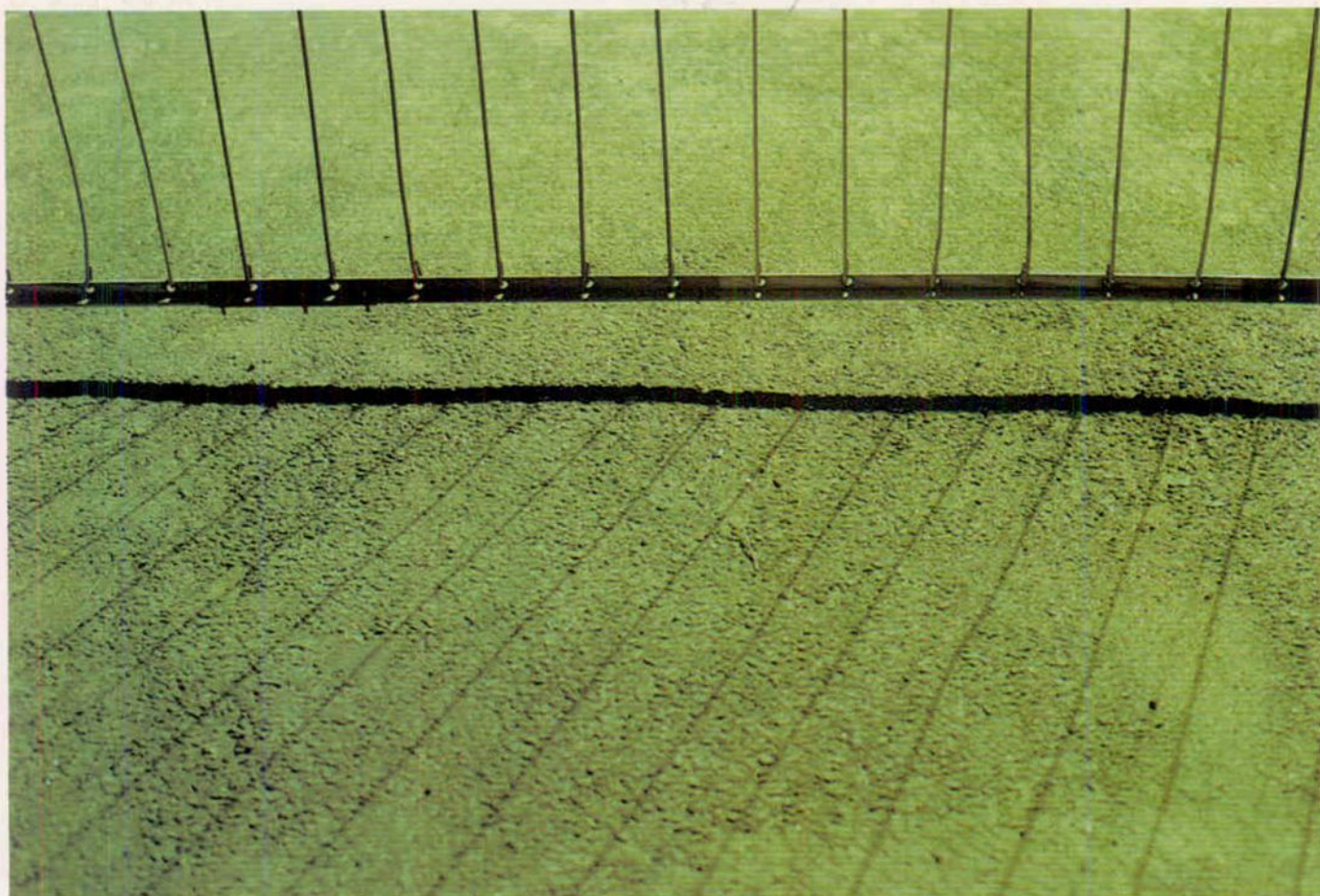
Shape

Simple shapes make good abstract pictures. Look for geometric lines, perfect spheres, ovals and so on, and reveal them best by a soft directional light source. Keep the composition as simple as possible by avoiding too many different shapes appearing in the same picture, and avoid confusing shadows which may result if your lighting is too strong and direct. Outdoors, look for interesting shapes silhouetted against the sky. By moving in closer, you may be able to isolate the subject well enough to conceal its identity but retain a pleasing abstract shape—a mass of chimney pots, for example, or the strong angles of a

Colourful boat The reflection of this brightly coloured boat form an attractive composition. You have to train your eye to notice potential abstracts like this



John Sims/Vision International



Lawrence Lawry

crane. By using telephoto lenses you will find it easy to isolate small details.

Texture

The material from which an object is made can be of more interest than its shape and depicted on its own can form an abstract image. A small section of tree bark, the swell of a rough sea, the smooth sheen of polished metal. Jagged rocks or crumpled paper, rough, or smooth textures and everything in between. Try strong side lighting and use a slow fine grain film to make the most of a really interesting texture.

Pattern

Patterns, whether created by man or nature, are ideal subjects for abstract photography. By changing your viewpoint and camera angle, you may see patterns you were not aware of previously. An overhead view of a crate of milk bottles is a good example, or an upward view of the keys of a typewriter. Avoid a too directional light or you will lose the pattern in a blur of shadows, though you may be able to use the shadows to enhance the abstract nature of the picture.

Colour

Bright areas of colour on sunny days make good abstracts. Wood painting on the side of a boat, flaking paint, shiny coloured plastic outside a supermarket. Look for blocks of colour that taken away from their context become abstracts.

Lighting abstract shots, is extremely important, particularly when the aim is to emphasize a particular characteristic. Light varies considerably according to the time of day and, of course, the weather, so it is a good idea really to look and see how the light changes the appearance of things, according to both its intensity and its angle.

The brighter light of midday shining head-on to a subject can give a completely flat, two-dimensional effect, useful to reveal shape, but not depth. This light can also help to show up very bright colours, ideal when blocks of colour are to form the basis of your abstract photograph. The same light at an angle to the subject, however, casts deep, dark shadows and exaggerates the three-dimensional aspect. It can be useful, though, when you feel the shadows themselves may form an abstract arrangement, or if you particularly wish to reveal the texture of an object.

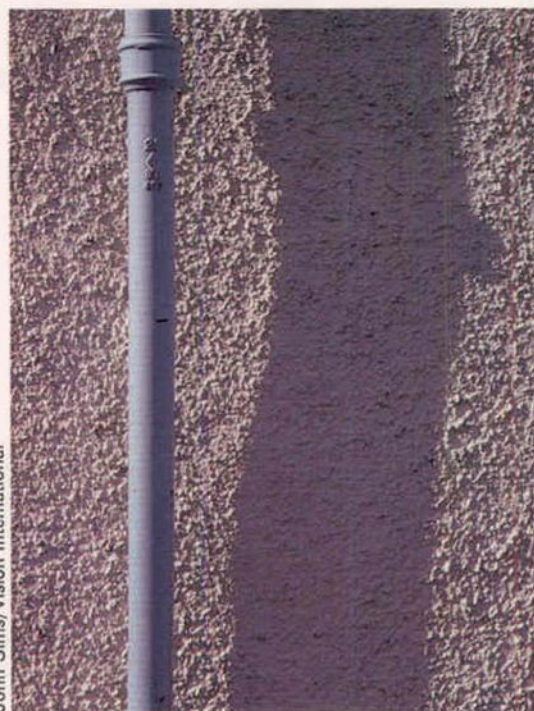
The soft flat lighting that an overcast day creates does not cast heavy shadows and bathes everything in a soft and gentle light. The lack of shadows and absence of bright highlights helps to give a two-dimensional effect and this type of lighting is very suitable for abstract pictures.

In low lighting there may be no details showing in the subject at all. An object lacks real shape and form in such light and may only be suitable where patterns of light and shade are the key factors.

Once you understand how lighting can

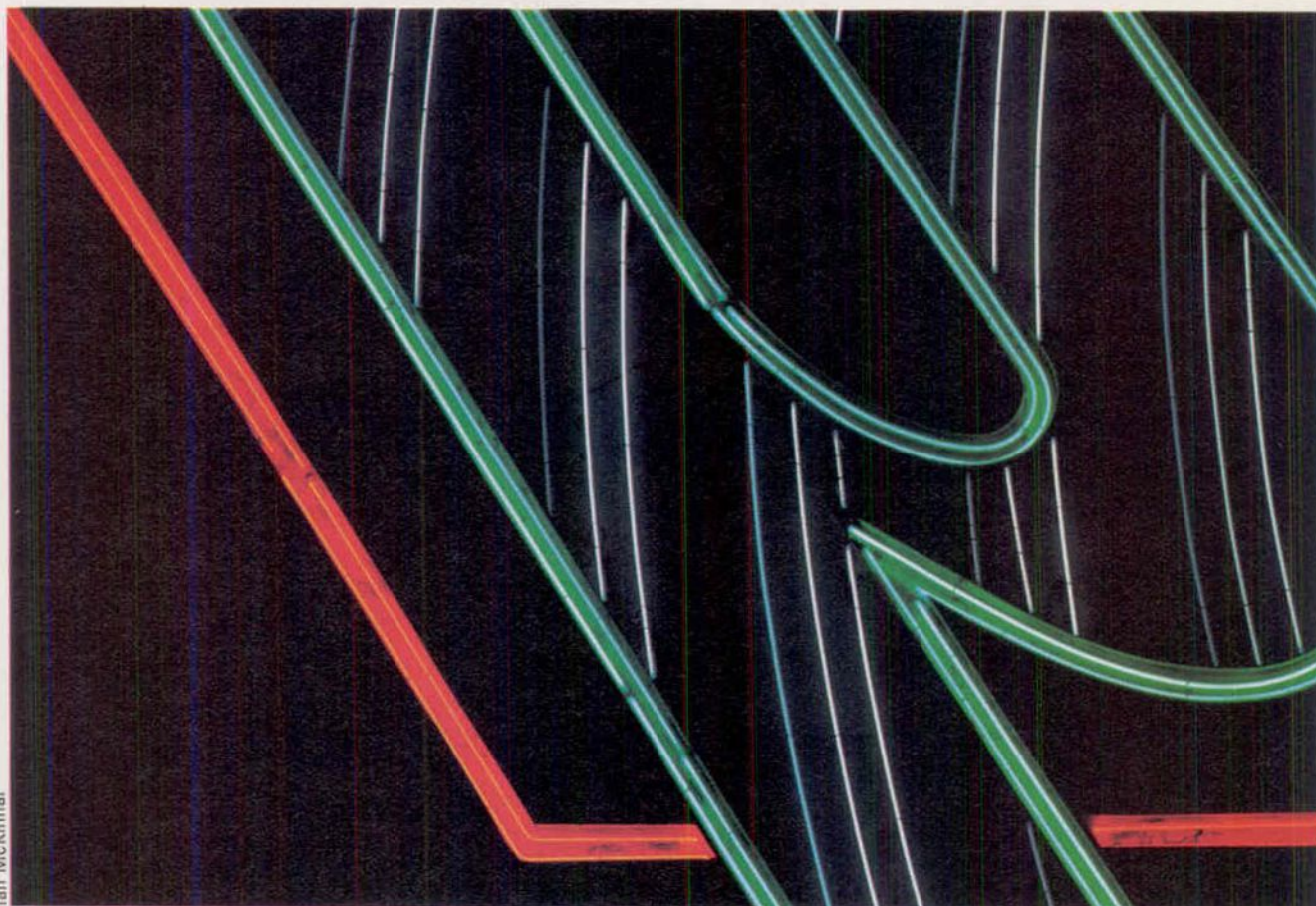
Fine lines *It is not important for the viewer to know what the subject is. The main thing is that the fine lines, colour and texture are attractive*

Drainpipe *Even very ordinary objects can make abstract photographs. Having noticed one you need imagination to compose the shot in an effective way*



John Sims/Vision International

Ian McKinnal



John Sims



John Sims/Vision International

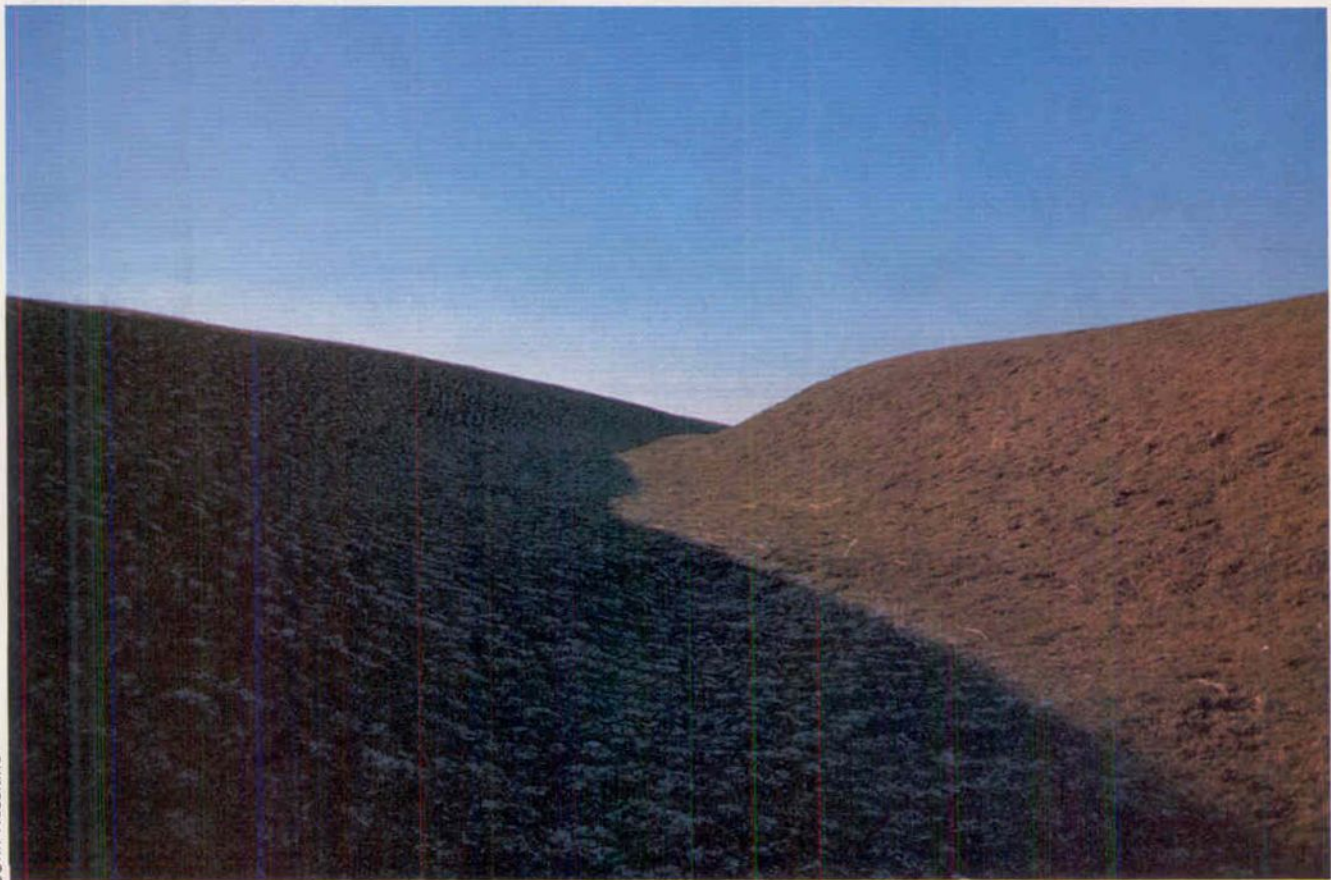


John Sims



Starting opposite page, top
Coloured lights The delicate lines and subtle colours of these neon lights take on a pleasant abstract appearance when isolated from the whole sign. Telephoto lenses are very useful for separating small areas of detail from the rest of the scene
Yellow canopy This would not have been particularly interesting if it had been photographed to look realistic. Just by framing a selected part of the whole scene and using an unusual viewing angle a very different shot has been produced. Not attempting to create a faithful image of reality, it depends on shape and colour for its effect
Red wall and canopy This shot works in a similar way, getting its impact from the shape and position of the shadow and from a strong colour contrast
Waterline It is not always easy to identify the subject in an abstract photograph. This shot of the side of a boat depends upon the colour and the strong line running across the composition but, like many other abstracts, its enigmatic feel unsettles observer, partly because the photograph has been presented on its side
Interlocking hills Abstract compositions are not restricted to buildings and other manmade objects. In the countryside you have to look carefully for subtle shapes and colour tones so that you can find pleasing and unusual subjects for abstract shots. This particular photograph is very simple but nevertheless effective

John Heseltine



be used to advantage in creating pictures, you can explore other ways of setting up abstract shots.

One approach is to find an abstract view of a familiar object by excluding those features that help to identify the subject. Think of a telephone, for example. It is normally instantly recognizable by its shape and features—but try isolating just one of its features, perhaps the curling wire leading from the handset. Providing you arrange lighting so that the telephone itself does not cast a give-away shadow, you can produce an intriguing abstract image.

Moving in close removes unwanted details which identify the subject or distract the eye. In large buildings, find stark geometric lines, harsh angles and flowing curves and separate them from the rest of the scene. Getting close will give a different view of the subject, one which perhaps is not seen very often. Isolate a small area of a window, seek out brightly coloured window frames, imperfections in glass. Move in close to walls to reveal unexpected patterns and textures, though take care with focusing as it will be critical at close distance.

You can explore different angles with close-ups just as you would with a larger, more distant subject. You do not have to hold the camera either horizontally or vertically—in fact the more variety you use in your angles, the more

variation you can get from one subject. Tilting the camera so that the object is slightly askew or diagonal in the frame may be all that is needed to produce a stunning abstract shot.

Another way to create an abstract picture is to choose a moving subject and deliberately allow it to appear blurred. Use an extra slow shutter speed particularly with strong coloured subjects against a contrasting background. Cars flashing past, people walking, waves swelling and ebbing—virtually anything that moves can be used.

Landscape *Disregarding the usual rules for composing a landscape shot can produce interesting shapes even if they do not include many details*

You can also move the camera around during a long exposure. Press the shutter release while actually shaking the camera and again use a slow shutter speed. Fairgrounds and streets at night can produce beautiful abstracts using this technique.

Reflections of things in water can make excellent abstracts, too: a row of brightly coloured rowing boats reflected in the gently rippling waters of a lake, for example, or trees merging on a river surface, photographed in black and white to emphasize the shapes.

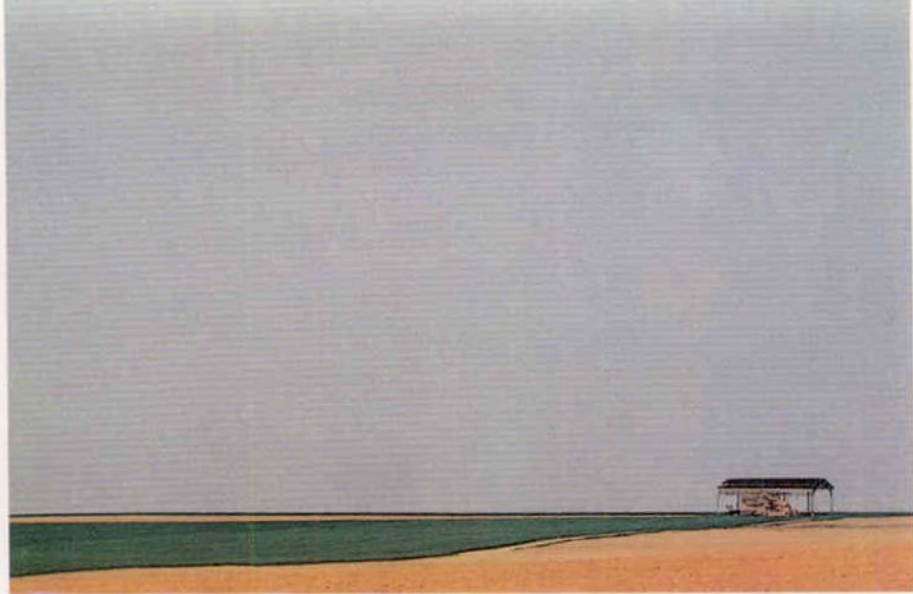
You may be surprised by the amount of abstract potential in the human body. Look for pleasing shapes—the crook of an arm, the curve of a pointed foot, or patterns made by creases in the skin or hair spread out on a pillow. Move in close enough or rearrange the camera angle just enough to make identification of the particular part of the body a little ambiguous or even impossible.

You can give an abstract slant to portraits by asking your sitter to hold up a piece of fluted glass in front of the face. Many kinds of figured glass are available and interesting effects can be achieved as the face appears to fragment and break up.

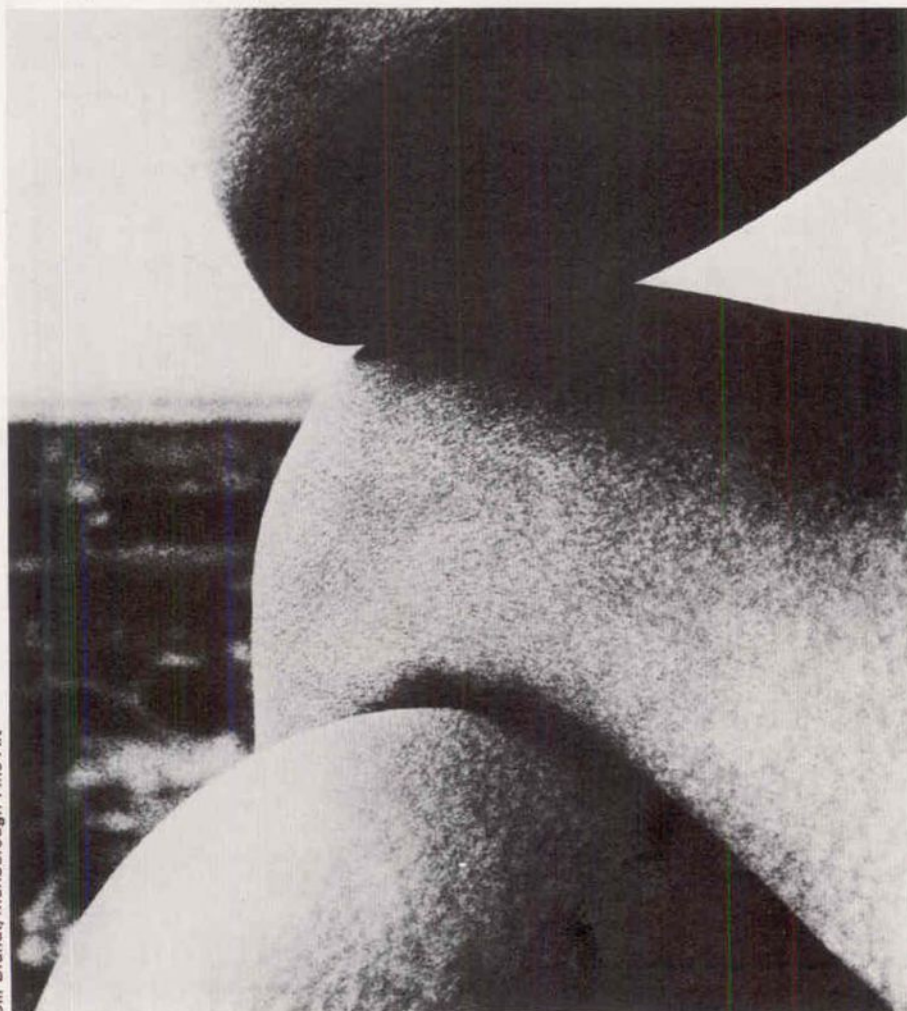
A good close-up lens or, failing this, a set of extension tubes, can be invaluable when moving in close to select details. Wide angle lenses are useful for creating unnatural differences in size between near and far objects. A vast array of lenses is not necessary, although a medium telephoto lens will separate objects from their normal context.

A good abstract is one which evokes comment from anyone who looks at the picture. If an abstract photograph of a mundane object is deemed 'interesting' or 'beautiful,' then it is a success.

Nudescape *There is plenty of scope for producing black and white abstracts. Shape and tonal contrast play a large part in making effective compositions*



J-N. Reichel/Agence Top



Bill Brandt/Marlborough Fine Art

Werner Forman

The application of a perfectionist and a highly individual approach have made Werner Forman world famous for his photography of the art and architecture of past civilizations



Werner Forman Archive

Now world famous for his superb photographs of art treasures, Werner Forman initially picked up a camera only because he disliked school so much. When he dropped out of school in Prague at the age of 14, he told his father that he wanted to be a photographer. But he was not telling the truth.

'I really wanted to be a pilot but I knew I was too young to train.' His father took him at his word and Werner was apprenticed to a photographic studio where he stayed for exactly six weeks.

The resourceful boy had already bought himself a camera on hire purchase, and had found ways of beguiling the security staff at Prague airport into relaxing their regulations. He started taking pictures of the Czech State Airline (CSA) fleet of airplanes and selling them to the manufacturers.

His first camera was a fixed lens Kodak Graphex, 'a dreadful thing that bumped out of your hand, worked at any speed it fancied and smelled strongly of glue'. There were only about three models in

Prague at the time and people used to make remarks about Werner's camera, mainly because of the smell.

At 60, Forman winces at the memory of such inadequate equipment, but at the age of 15 he was undaunted and rapidly established himself as the state airline's photographer. He kept the job until, when he was 18, the CSA ceased to exist. It was 1939, Czechoslovakia had been invaded and during the next six years of German occupation Werner, his father and his brother Bedrich were sent to concentration camps.

Miraculously the whole family survived, but the memories remain painful and Forman prefers not to remember details of a period that caused him so much distress.

The effect on his life was immense. It was to lead him to a study of the art of ancient civilizations in an attempt to make some kind of sense of his own, violent, age.

With his designer brother he became interested in Chinese art and with

Temple of the warriors Taken at dawn in Chichen Itza, Mexico. Forman used a wide angle lens to emphasize the statue

On location The photographer chats to an old lady during an early assignment in the wilds of Inner Mongolia



Werner Forman Archive



Werner Forman Archive

innocent enthusiasm decided to produce a book on the subject. 'We were fascinated by the culture,' he recalls 'fascinated by all the basic elements of a vast culture which had gone on ticking throughout 3,000 years. So we dipped into it and came to our own conclusions.'

'When my brother and I decided to do this book in Czechoslovakia for Czech readers, we were fully aware that much of the Chinese art in Czech collections was mediocre. Never mind, our country had never had a book on Chinese art and we wanted to do it.'

While they were printing the book, a young publisher from north London named Paul Hamlyn came to Prague to investigate printing facilities for the company he had launched. He saw the Chinese art book coming off the presses and instantly decided to buy it. Forman was unnerved. 'The book was meant for Czech readers. We didn't think it was right for the Western public, but he wanted it and we were flattered.' The sales topped half a million.

This was the start of an extraordinary career in which, over three decades, Forman has produced more than sixty books of his photographs. And with scholarly perseverance, the man who meant to train as a pilot has become an expert on the art of ancient civilizations and primitive cultures and ranks as one of the world's greatest photographers of art treasures.

He and Bedrich worked on the books together until Werner shifted his base from Prague to London in 1970. 'I say base, and I do have a nice house in London, but I'm never there. I come back from a

trip, force the front door open through a pile of mail, deal with bills and other necessary things and then I'm off again.'

On a single trip he may take up to 5,000 exposures with a camera that must stand up to fairly bad conditions. Forman is always encountering sand, dust, salt and moisture—each of which can wreak havoc on a camera. Having worked his way through all the most famous models, Forman is dismissive of practically all but the Mamiya RB 67, 'a heavy, bulky and unsophisticated piece of equipment which will take a lot of rough treatment.'



Caught by the setting sun *This fine portrait of an old Eskimo woman was taken in Kotzebue, Alaska*

Chinese seaman *Here Forman has used well aimed lighting to complement this fine carving by a Tlingit Indian*

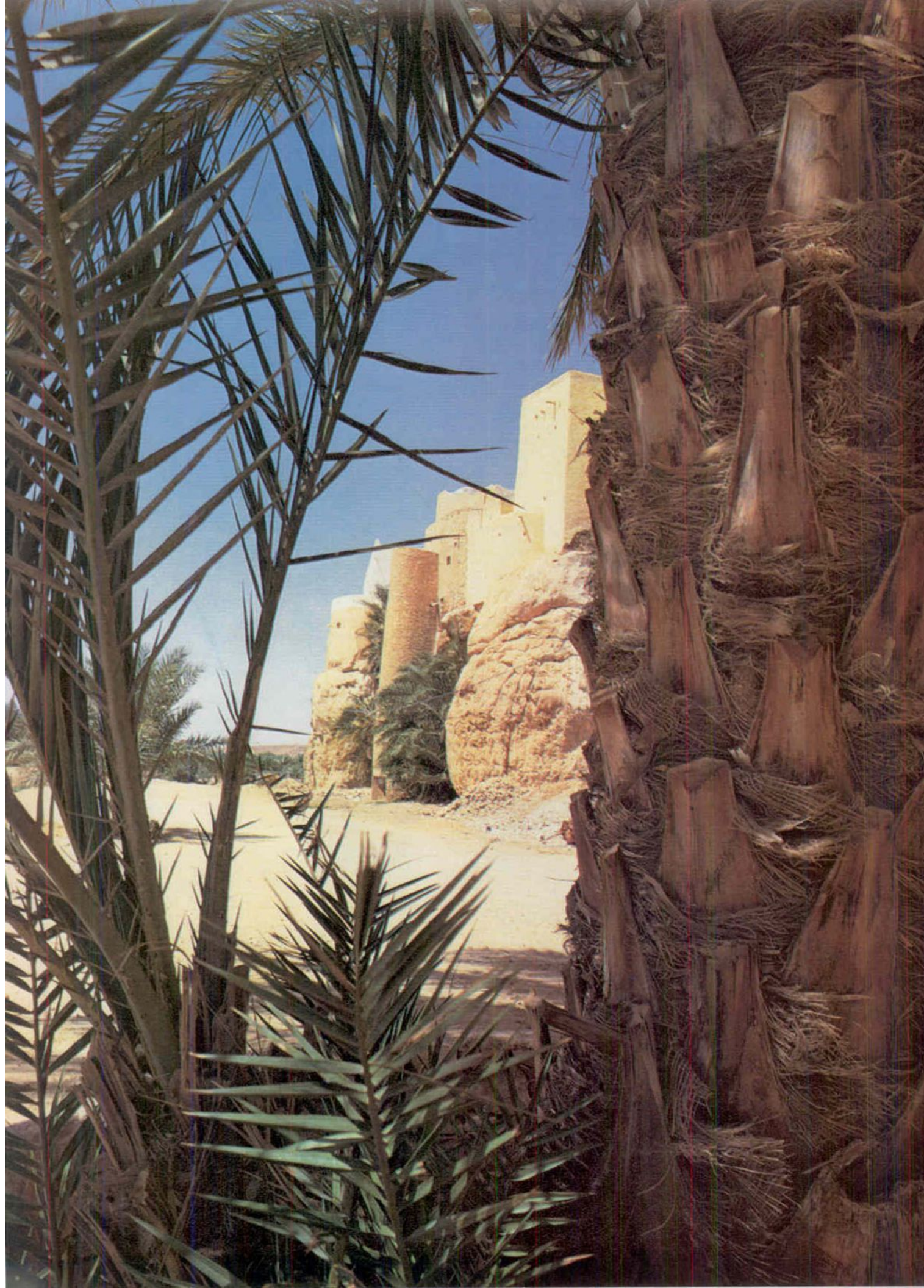
'Holding the Mamiya is like holding a suitcase in your hand, but it's reliable. It has a lot of devices to remind you if you are doing foolish things, but at least you can still do them if you want because it's not fully automatic.'

In the early days, Forman had to work hard to persuade curators of museums and art galleries that he would not be a nuisance in their galleries. Now some of the world's leading museums give him the exclusive right to photograph their collections.

Yet apart from the privilege of being admitted, he is rarely given special treatment. Security regulations dictate that he must work during normal opening hours and with all the gallery lights on, though he can often move art treasures about. If he is faced with photographing a huge piece of sculpture, too big to move, he may use filters to compensate for the colour cast that the gallery lights might otherwise produce. However, if he has to work under

Museum piece *Through careful lighting Forman has given life to this little model of the Aztec god, Xipe Totec*

Berber stronghold *The city walls of Mzab in the northern Sahara have been framed to show its position as an oasis*





Burning the forest By waiting until the smoke from the flames had turned orange and composing his picture carefully, Forman captured the drama

often of inferior quality.'

The only equipment he is really fussy about are lenses, which take preference even over cameras. He will not buy lenses for the sake of the name of a lens; he simply tries out Japanese makes until he finds one with the kind of definition that suits him. He generally takes a small range of lenses on assignments and this includes a 300 mm lens for the Mamiya and a 180 mm for his Bronica 645.

When taking photographs for his many books, Forman finds 6 x 7 cm by far the best format. Though he would prefer a larger format, this is the largest size that is practical to carry. 'Sheet film can only be changed in a darkroom, and on a busy day I might need up to 100 plate holders. I can't carry that much around with me.'

A smaller format, on the other hand, has its own problems. 'I find 6 x 6 cm square film wasteful because it imposes on the photographer a sloppy way of composing a photograph. You know you have to crop afterwards. I prefer to crop straight away. The 6 x 7 format is more economical too, since each film contains more exposures and, on a long trip when I am not near any source of supply, I must carry hundreds of films with me. So every economy counts.'

Because his books are usually about ancient cultures Forman tries to eliminate people, cars and any other signs of the 20th century from his photographs. Most ancient monuments are surrounded by the paraphernalia of the tourist trade and the demands on his ingenuity are considerable. Forman avoids the crowds by working either very early in the morning or late at night. 'Depending on the season and the place, this could be as early as four in the morning, but no matter how early it is, I still have to beat the guard patrols too—and this can be a tricky business if they are not feeling friendly!' Forman is also the photographer and editor of a series entitled *Echoes of the Ancient World*. The books in this series include *People of the Totem*, *Feathered Serpent* and *Smoking Mirror*, *Viking*, *The Moors*, *The Way of the Samurai* and *Black Kingdoms*, *Black Peoples*. Forman feels that the best of these is *The Moors* and critics have described his photographs of landscape and Islamic architecture as being of 'dazzling beauty.'

These books examine the way of life and beliefs of people from many different cultures. Photographs of landscape, architecture, art and artefacts are carefully planned to complement the text. Forman works closely with the author from the outset of the project and spends many hours researching and planning.

Forman is not solely interested in photography for its own sake, but in using it as a medium for expressing his enthusiasm for non-European cultures.

fluorescent lights even filters cannot correct the strong blue overcast produced. In these situations he overexposes his pictures and then underdevelops the film later so he can achieve the exact colour balance he wants.

He prefers to use Ektachrome films, 'not because they produce the best results but because they are the best to corrupt. Contrary to general belief, you can underdevelop them very effectively and I find they have the largest tolerance for processing out of the norm.'

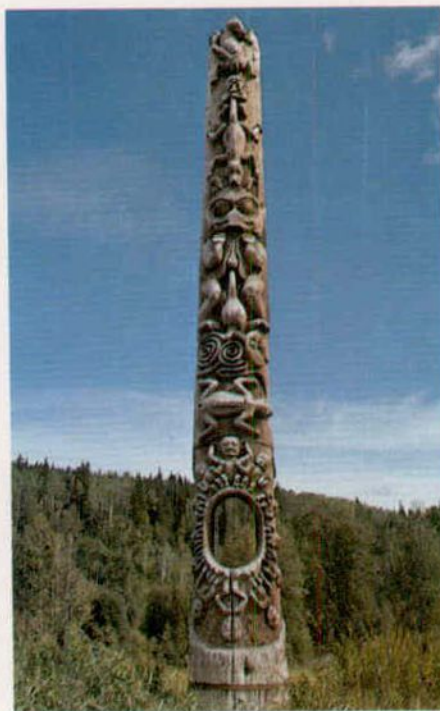
He hardly ever uses black and white film because the publishers with whom he works generally want colour and he is disillusioned with the quality of the reproduction of black and white prints in books. 'Most of it is lousy because presses and paper are designed for colour nowadays, and when black and white pictures go into the same process as colour illustrations, the chances of them being printed properly are negligible.'

The hallmark of Forman's museum photography is the masterly way he lights an object, whether it is a minute piece of jewellery or a massive piece of sculpture.

The secret lies in the simplicity of his technique. 'I use long exposures of up to 60 seconds and sometimes just an ordinary pocket flashlight.' He never uses strong light because the organic

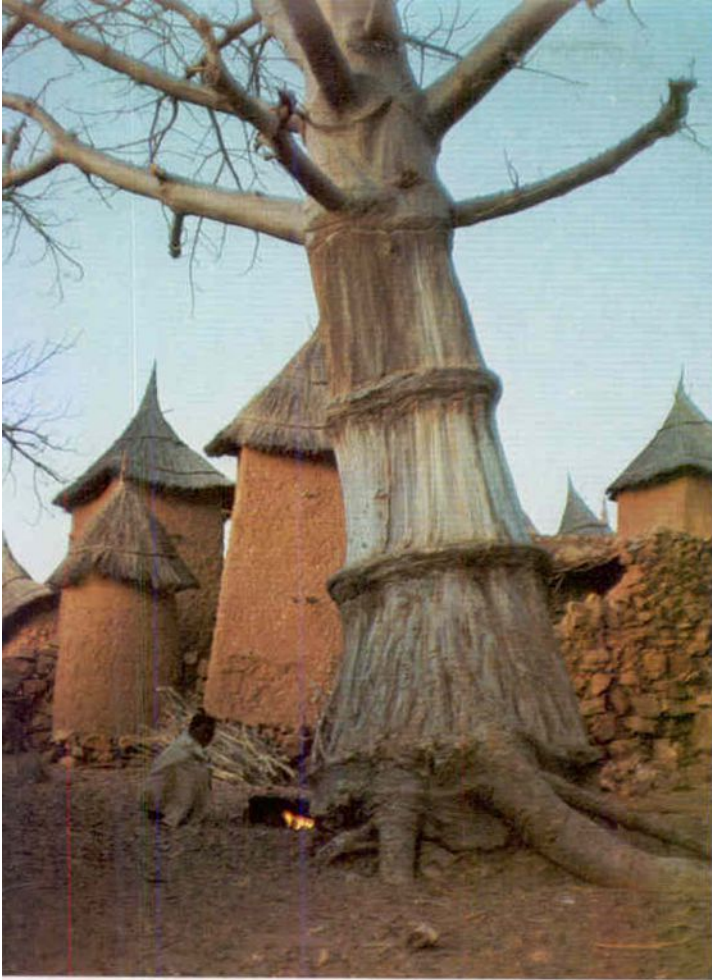
materials he photographs would be at risk from the heat, and a simple reading light is often quite powerful enough.

He travels with two stands for the most simple floodlights, a complete set of 120 and 220 watt bulbs, endless reels of connecting cable, white reflecting surfaces and a supply of small flashlights. 'I'm a one man show, not an Indian god with six pairs of arms, so unfortunately I have to stick to lightweight tools that are



North West American totem By judging the angle of his shot, Forman has isolated the totem's figures from their forest setting

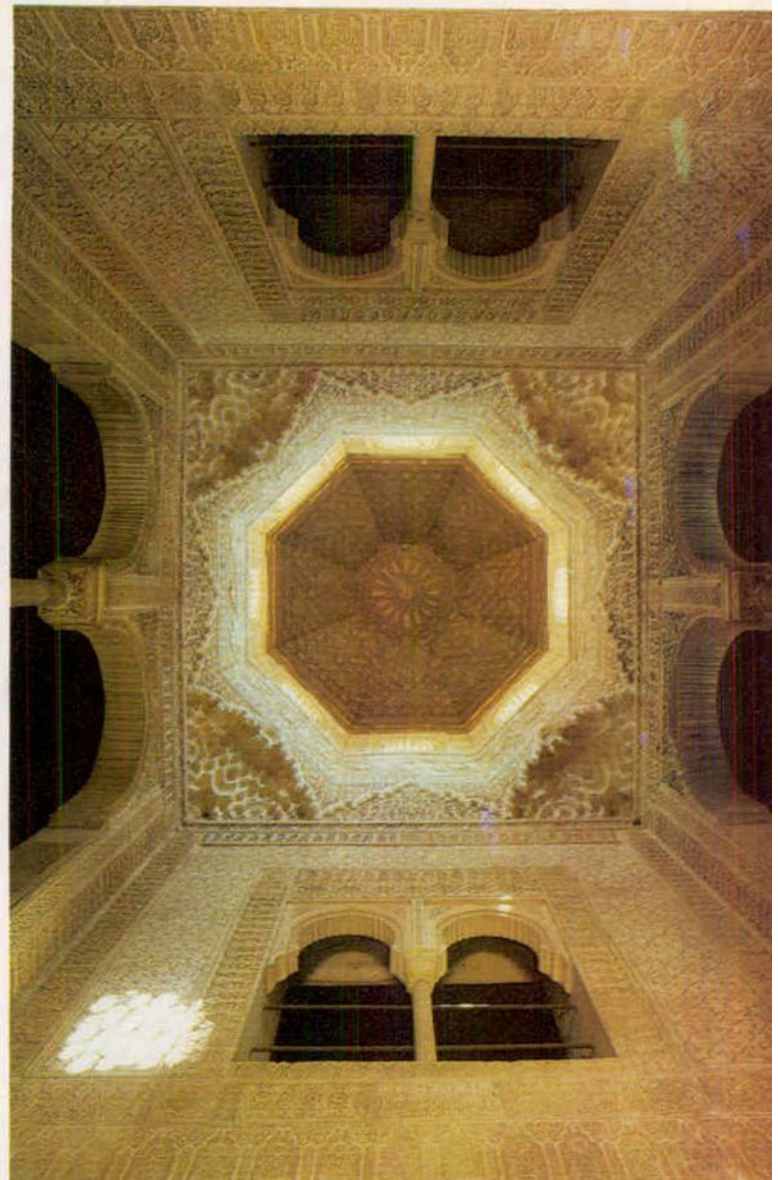
Werner Forman Archive



Granaries of the Dogon Framing these village grain stores between the trees, Forman showed how Mali architecture is inspired by its natural surroundings

The Tower of the Infantas, Alhambra Palace Taking this shot from directly under the central lantern, Forman was able to emphasize the symmetry of Islamic architecture

The Oba's butchers One of a remarkable set of Benin bronzes in the British Museum. By lighting the plaque from the side, Forman has shown the relief at its best



He becomes completely involved in the particular culture that he is trying to record, and his work often displays his own personal interpretation of that culture. For his books on Marco Polo and Captain Cook he followed their journeys, absorbing and evoking a sense of history as he photographed landscapes of the places recorded in the explorers' diaries. In his other books, too, his photographs are often carefully chosen to show a particular vision of a culture, such as the sombre brooding landscapes of his book on Viking culture.

In 1957 Werner Forman produced a book which he considers to be in many ways his most satisfying. Called *Tapestries from Egypt*, it contains an extraordinary collection of tapestries produced by children—some only five or six years old—without the benefit of any formal education. Yet to Forman, the tapestries express 'the greatest adventure in creativity'. In them he found what he has always sought: a simple, direct expression of thought and feeling; works of beauty which address themselves to everyone throughout the ages.



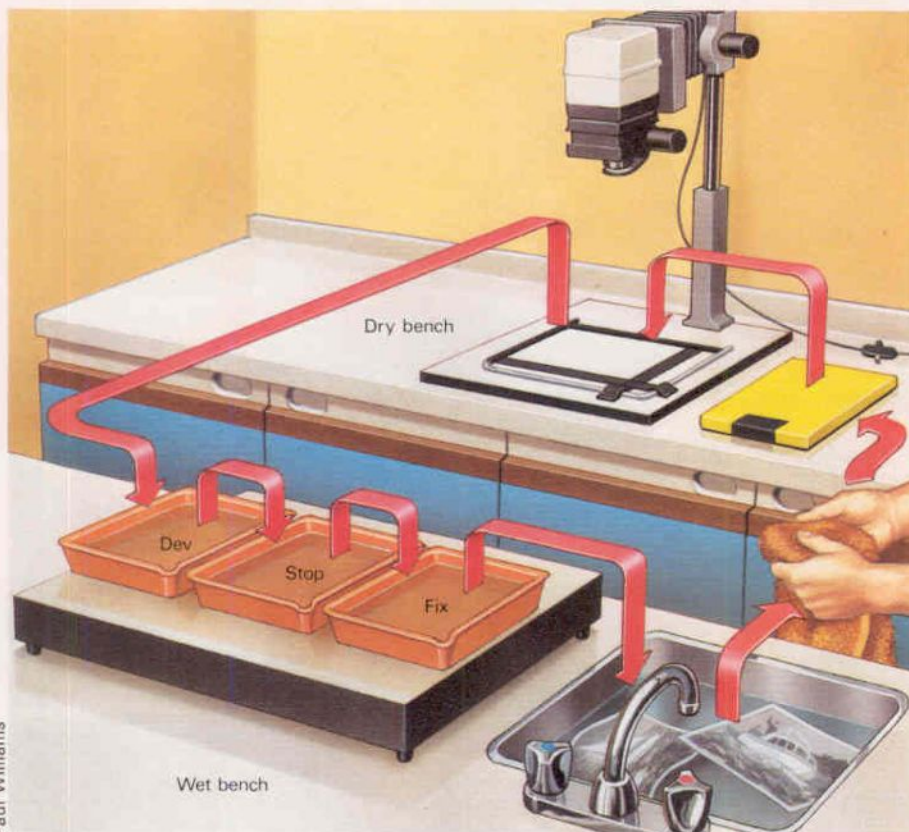
Werner Forman Archive



Darkroom

Making better prints-2

Processing and drying have an important part to play in the appearance and quality of the final print, so darkroom routines must take these outwardly simple tasks into much greater consideration



Paul Williams

Making top quality prints is not hard. If your enlarger projects a sharp image onto your printing paper, and if your darkroom is clean and free of dust, all you need to do is make sure that your processing technique is consistently correct.

Print handling

Prints must be put into the developer dish so that the whole of the print is covered by developer almost at once (see page 145).

Always use tongs to handle prints during processing. Developer and stop bath can cause skin irritation, and you are much more likely to leave chemical stains on your prints if your fingers are contaminated with processing solutions than if you use tongs. Be careful, however, with resin coated (RC) papers—these have a more delicate emulsion than fibre based papers and may be scratched

by carelessly used print tongs, fingernails, or even by scraping the print against the sides or base of a dish.

Agitate your prints properly when they are in the chemical trays, and follow the manufacturer's recommendations for minimum processing times. When you transfer prints from one dish to another, allow a few seconds for chemicals to drip from the print. Reducing the amount of chemical transferred from one dish to the next helps you to get the most from your chemicals.

Print tones

Developing negatives so that they match standard, normal contrast grade printing paper greatly reduces problems with print tonality. Assuming that your negatives are properly processed, you can make sure of getting the best from your printing paper by monitoring the processing carefully.

Establishing a routine To avoid mishaps, keep your wet and dry work areas clearly separate and always make a point of wiping your hands before returning to the enlarger for printing

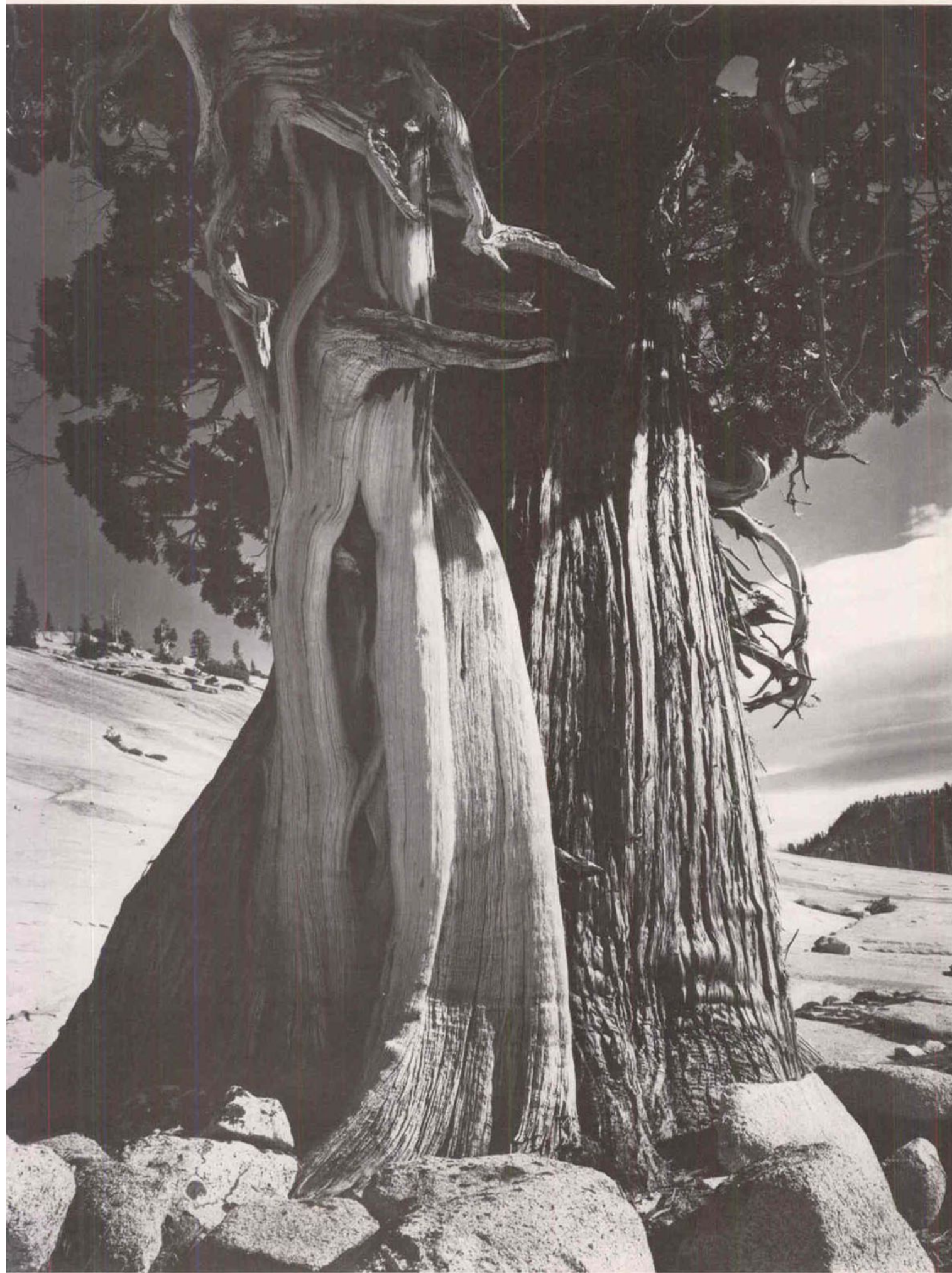
Juniper, Lake Tenaya 1938 Sharpness, good contrast, texture and form all combine in this powerful image shot by Edward Weston

A preliminary test using two small pieces of printing paper can be helpful. Expose one piece to ordinary room lighting, so that it is completely fogged, then develop and fix in the normal way. Place the other piece in your fixing dish without exposing it at all. You now have two pieces of printing paper in your fixer, one as black as the maximum possible with your paper, the other as white as possible. When you fix your prints, compare them with the two pieces of paper: if the darkest tones in your prints are noticeably less black than the maximum possible, or if the palest print highlights are slightly grey, then there is something wrong with your print exposure or processing.

Less than fully black shadows are a sign of print underdevelopment or of printing a flatter than normal negative on too soft a grade of paper. If your print shadows still look grey after you have changed to the right paper grade, check that your developer is at the right temperature.

To make the most of its characteristics, printing paper *must* be developed for the full recommended time at the correct temperature. You cannot compensate for overexposed prints by snatching them from the developer dish before the shadows have developed to their full richness, and you cannot develop prints in solution that is too cold. If your darkroom is kept a degree or two warmer than the recommended chemical temperature, your developer is likely to stay warm enough. But if you prefer to work in a darkroom that is cooler than 22°C, you should consider buying a thermostatic dish warmer to heat your developer.

Grey highlights are usually caused by fogging. Safelight fogging is explained in another article (page 311). There are



other causes of print fogging, however; the commonest is poor paper handling. Do not leave boxes of paper open in the darkroom, even under the safelight. Boxes of printing paper usually have an opaque plastic or paper inner wrapper. Do not throw this away. Wrap up any unexposed paper and put it back in its box before you turn on normal room lighting. Alternatively, store your paper in specially designed paper-safes. These enable you to remove one sheet at a time while protecting the rest from light. These are available from photographic dealers. Another cause of highlight fogging is a developer that is too warm. Do not be tempted to try to compensate for cold chemicals by adding very hot water. Stay within the temperature limits recommended by the manufacturer.

Agitate your prints properly in the chemical dishes. With experience, you learn to tell whether your prints have been given approximately the correct exposure while they are in the developer. If the print is obviously much too dark or light, throw it away instead of wasting fixer solution on it. But do not be too hasty about assessing your prints while they are being processed. There are two factors that make it difficult to judge prints while they are wet.

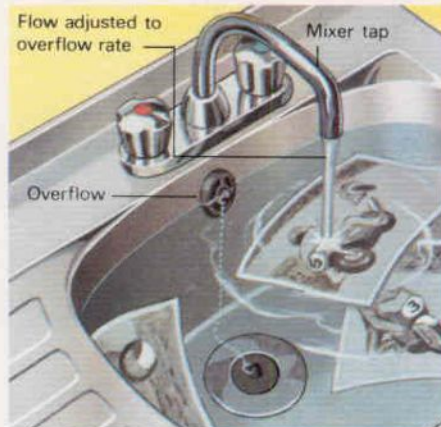
To start with, prints usually look considerably darker and more contrasty under darkroom safelighting than under normal lighting. To estimate the degree of adjustment to printing exposure you need to give, inspect your prints in white light. Allow your eyes to re-adapt to the brighter light for a moment or two before you decide on exposure adjustments. Keep in mind the eventual conditions under which the print will be viewed when deciding on the correct print density. Prints intended to be viewed by ordinary room light may need to be lighter than those viewed under strong spotlighting.

The second factor that can affect the look of your prints is drying. Wet prints are usually a little darker than they are when dry. The difference is slight, and unless you want to make prints for display in exhibitions or galleries it can usually be ignored.

Stains and print washing

Staining or variations in image density are usually caused by poor processing. For example, a common cause of grey staining is underfixation combined with underagitation. On the other hand, extreme overfixation can lead to high-lights being bleached out. Do not leave your prints in solution baths for less than the recommended time, but do not exceed these recommendations by more than a few minutes either.

Even if your prints are properly developed and fixed, staining can still occur if they are not washed properly. If you make your prints on RC paper, this is not a major problem. RC prints can be washed for as little as four minutes in running water at 20°C, and they air dry quickly if clipped to a line or placed in a



Washing in a sink A simple, if risky, way to wash your prints, using running water adjusted to the overflow

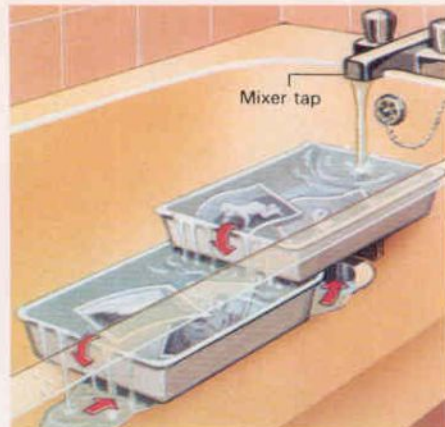
rack in a well ventilated room after excess water has been blotted or squeegeed off. An additional advantage of glossy finish RC paper is that it does not need to be glazed to dry to a shiny finish, although with some papers a better gloss can be obtained by heat drying using, for example, a fan heater. RC prints should not be washed at high temperatures or for too long. Too long a soaking can impair the finish and lead to seepage of water into the paper base at the edges of the sheet.

Fibre based papers need to be washed more carefully. Their absorbent base soaks up fixer, which causes print fading if it is not thoroughly removed by washing for at least 30 minutes. This time can be cut if you use a chemical washing aid or fixer clearing agent as an additional processing step before washing. A properly washed fibre based print is more stable and hence lasts longer than an RC print, so it is worth going to the extra trouble of making fibre based prints of photographs that are particularly important to you.

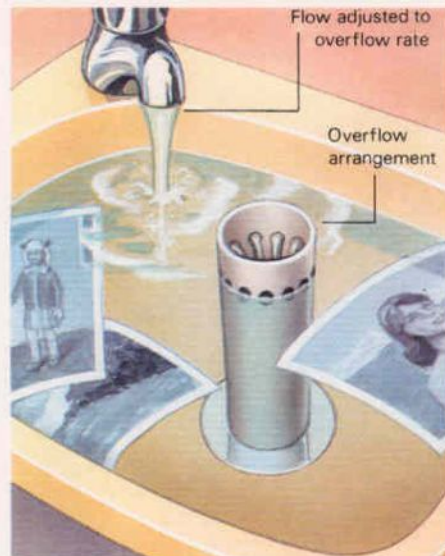
Whether you are printing on RC or fibre based paper, the main requirement for effective washing is a constantly changing flow of water to remove fixer and chemical by-products from the print. The simplest way to meet this requirement is to use a specially made print washer. The best of these devices ensure that each print is held separately from the others with water flowing over both sides.

Efficient washing systems using the cascade principle can also be set up, and a typical arrangement is shown. Water overflows from the top dish and into a lower one. Freshly fixed prints are placed in the lower dish and moved upwards at some midpoint during washing. The bottom dish is heavily contaminated with fixer, the top dish contains virtually clean water.

Most home printers wash their photographs in ordinary baths or sinks, but prints need more attention for good results. The sink should have an efficient overflow outlet so that the flow of water from the tap can be adjusted to



Cascade arrangement Really efficient washing of a large number of prints is best done by using dishes in the bath



Improvised overflow Plastic piping of suitable width can be cut and drilled to make a really safe plug overflow

match the outflow. A rubber hose can be attached to the tap to ensure good circulation of water in the sink, but the prints should also be stirred periodically by hand to make sure that they are not sticking together or floating into corners of the sink away from the flow of fresh water.

The disadvantage of washing prints in a sink or bath is that fully washed prints are contaminated with fixer when more prints are added to the water. To be safe, time your print washing from the moment the last prints of a session's work are put in the water. And be especially careful to regulate incoming water with the overflow rate.

Drying prints

As already mentioned, RC papers are easy to dry. Apart from clipping them to lines or putting them on racks, RC prints can be left to dry face up on any clean level surface, dried in the hand with a hair dryer, or even squeegeed face out onto a smooth wall if the finish is water resistant. It is difficult to dry RC prints

badly—all these methods give flat unmarred prints quickly and with little fuss. Any problem with RC print drying is usually caused by excessive heat and trapped moisture.

Special professional RC print dryers are made that use radiant heat to dry glossy surface RC papers to a high glaze in seconds, but these are very expensive. Attempting to imitate the operation of these machines can lead to trouble. Too much heat applied to an RC print can melt the plastic coating.

You should never attempt to glaze glossy prints on RC paper by squeezing them onto a chromium plated or stainless steel glazing sheet. The water cannot escape through the impermeable base and if heat is used the resin coating is likely to melt and stick to the glazing surface. You can, however, use a glazer, either flat bed or rotary, for drying print material. Surplus water should be removed from the prints by blotting or squeegeeing and the prints should be placed with their backs in contact with the glazing or dryer surface with the fabric cloth of the dryer lightly in contact with the print emulsions. The temperature of the dryer must not exceed 90°C or the print will be damaged.

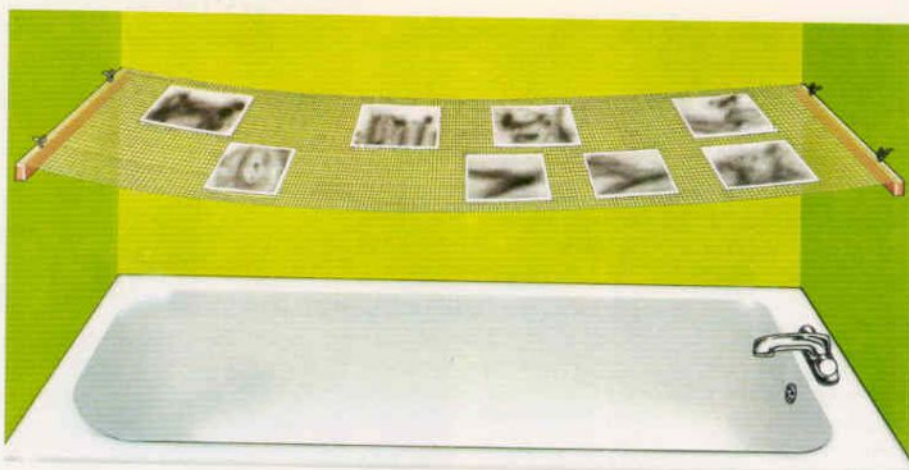
Heated dryers

A flat bed dryer and glazer is ideal for drying prints on fibre based papers and for other than a glossy surface the treatment is for RC material but there is less need to worry about the temperature.

Glossy surfaced fibre based papers do not give a deep glaze finish unless they are dried with the print surface squeegeed against a flat shiny sheet of metal or glass. Heated glazers use a sheet of plated metal or stainless steel. The wet print is squeegeed onto the sheet, which is then placed in the dryer. A cloth blanket holds the print and plate firmly together while a built in heater gently evaporates the moisture. Large professional dryers are also available that use a rotating plated drum to dry a con-

tinuous stream of prints by the same method. With either small or large heated dryers, it is easy to produce prints that do not have a high glaze. Simply put the prints in the dryer with the picture side facing the cloth blanket instead of the glazing plate.

A problem encountered when drying fibre based prints with heated dryers is that of print curl. Prints emerge from the dryer with a pronounced curl but are easily flattened enough to be mounted in an album or a picture frame when they have been allowed to cool. Most drying methods are likely to produce fibre based prints with a pronounced curl. The problem is inherent in the construction of the paper. Both print emulsion and paper base absorb moisture and swell slightly. But the amount of swelling is slightly different for each, leading to prints that are curled inwards towards the emulsion side. Prints that are hung to dry on lines or placed in racks are usually very curly and need to be flattened. One way to do this is to carefully draw the print over the edge of a table, taking care not to crease or crack the emulsion. If you use this method to flatten prints, make sure that your print is not so dry that the emulsion is brittle and easily cracked.



Bernard Fallon

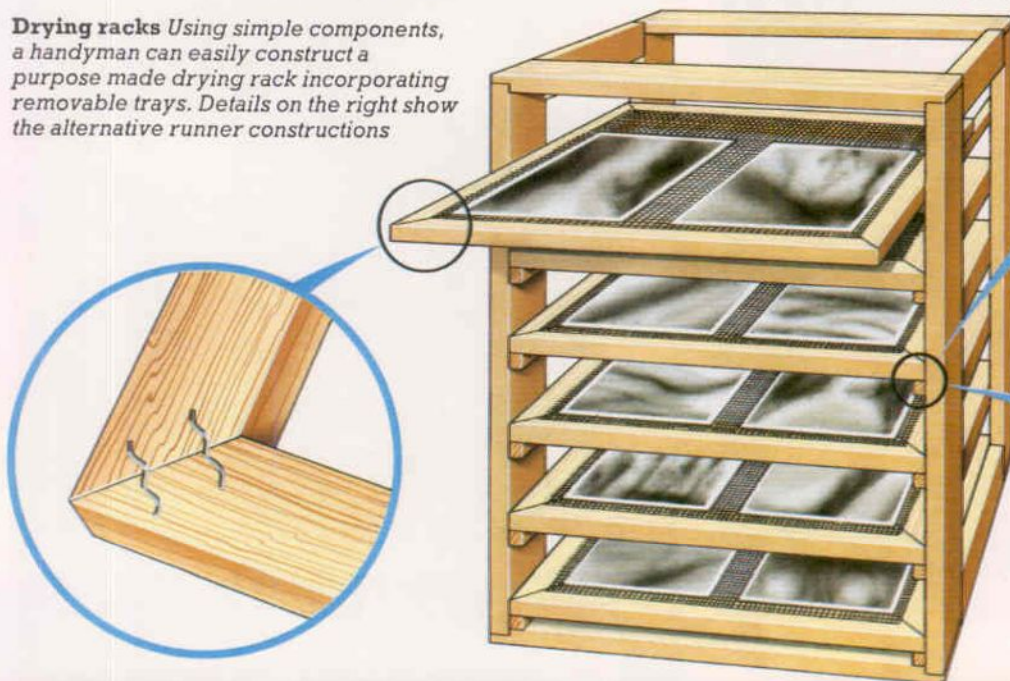
Air drying prints

An arrangement of plastic netting, battening, hooks and eyes used to make a drying hammock

A simple way of drying prints that gives minimum curl is to air dry them gradually on screens made of plastic mesh. Suitable mesh is obtainable from gardening suppliers. The mesh can be stretched over frames or made into a hammock with battens at each end. The secret of preventing curl is to place the prints on the mesh *face down*. Surprisingly, the mesh leaves no marks on the surface of the print. Instead, the damp emulsion stays in contact with the mesh until the print is almost completely dry. Drying is finished when the print springs away by itself from the mesh with a slight curve. The adhesion of the wet emulsion to the mesh for some of the time prevents the curve becoming too great. An additional advantage of this method is that it is easy to keep the mesh screen clean. The cloth blankets used in heated dryers easily absorb fixer contamination from poorly washed prints and can pass it on to more thoroughly washed prints and cause staining on these. Plastic screen mesh only needs a quick rinse to be made clean enough for further use.

Drying racks

Using simple components, a handyman can easily construct a purpose made drying rack incorporating removable trays. Details on the right show the alternative runner constructions



Bernard Fallon

Street carnival

Street carnivals are usually lively, colourful occasions which offer plenty of scope for the photographer, but you still need skill and imagination to make the most of the opportunities

Shooting a street carnival event such as the Chinese New Year requires agility, planning, and a lot of film. Sergio Dorantes, a leading editorial photographer, was amply supplied with these basics when he set out to shoot this photo essay.

Sergio contacted the authorities in advance and obtained permission to station himself within the central area, but most events took place in the streets, where no special permission was needed. He arrived three hours before the official start and began acquainting himself with the people who were involved. They were quite happy to explain what would be happening and willingly posed for him, and they gave him a little silk streamer with Chinese characters on it to wear on his jacket. His interest in them established a



contact with the players that stood him in good stead when they were performing.

'I would say the key word in an event like this is *anticipation*. At first, I was looking for too many things,' says Sergio.

As things were going to happen very fast, Sergio found an average exposure and set his shutter speed and aperture accordingly. Since the day was dreary and dark and, in addition, he needed to catch the action of the Kung Fu fighters and the lion dancers, Sergio chose to use 200 and 400 ASA (ISO) film. He also used some of his favourite film, Kodachrome 25, for portraits in conjunction with a warming filter.

He carried three camera bodies, one of which had a motor drive, and a full range of lenses, all with UV filters. He mostly used the 20 mm, 28 mm, 55 mm



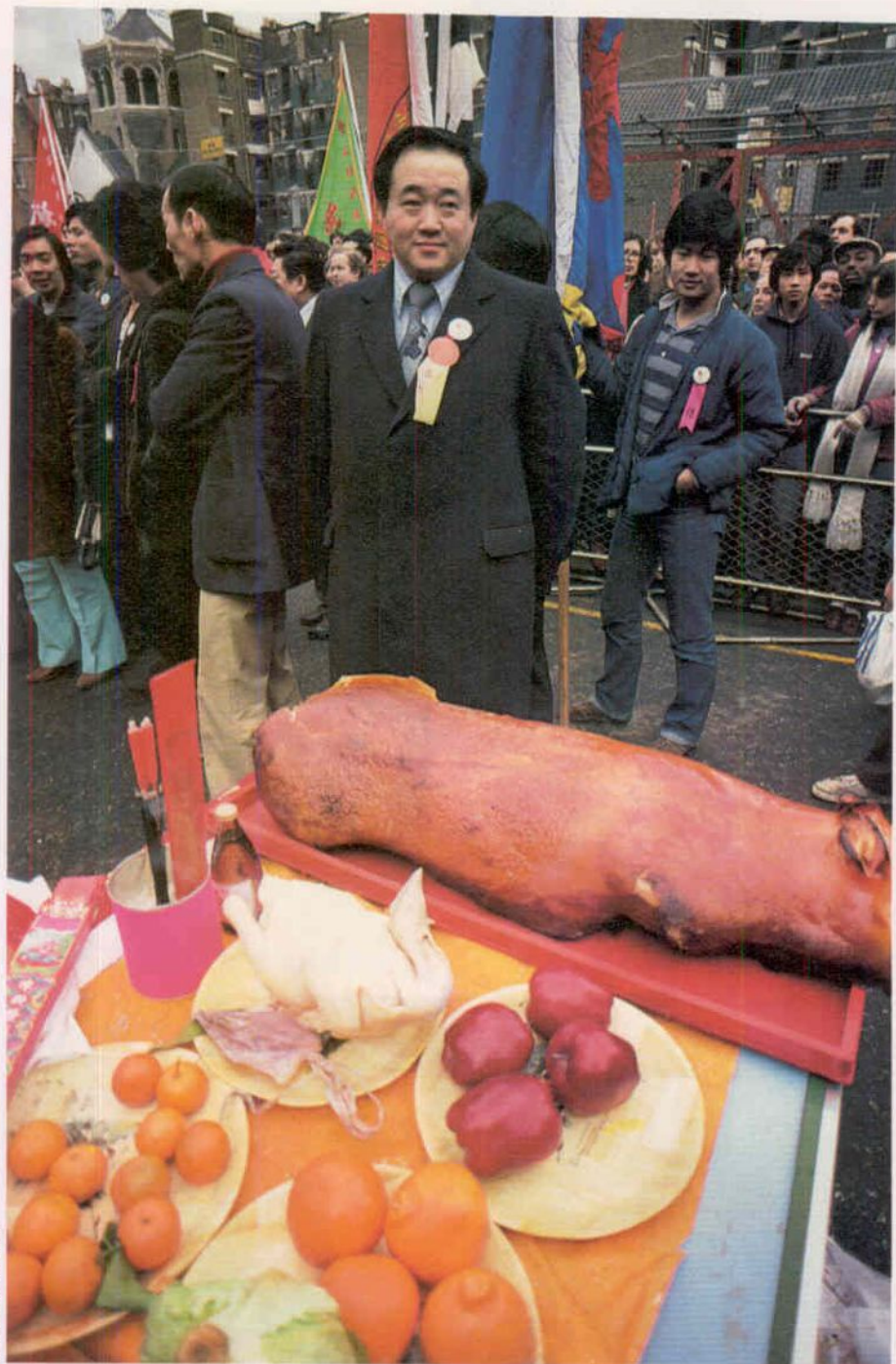
Banner at window This shot summarizes the Chinese New Year, with the woman at the window, paper lanterns, and a banner offering best wishes for the year of the cockerel

Lion dancers Being in the right place at the right time gave Sergio this shot of the eagerly waiting girls

Chinese banner The close-up detail of this intricate banner glows with bright colours, shiny fabrics, metal bosses and sequins

Planning Sergio Dorantes arrived early and made friends, so the players were willing to pose specially for his photographs

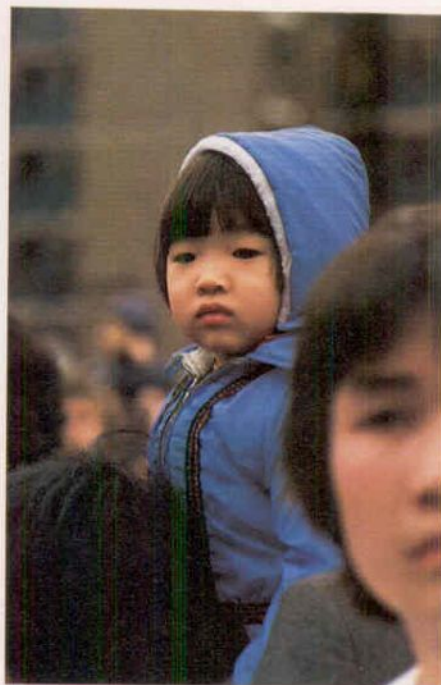




Sergio Dorantes

macro, 105 mm, and an 80-200 mm zoom lens. 'I myself never find that I need the normal 55 mm lens—though there are many famous photographers, Henri Cartier-Bresson, for instance, who use *only* the normal lens. I would certainly not say they are in the wrong! But for me, the 105 and the 20 mm—I could make a living with just those two lenses.'

He offers a word of caution: 'People often make the mistake with the wide



Child in blue To find a face in the crowd, Sergio used his 80-200 mm zoom lens and took this portrait shot of a child watching the ceremonies

Feast A 20 mm wide angle lens can exclude confusing background detail just as well as a telephoto if you move in close

Kung fu fighters Action shots require patience and willingness to waste a few frames to achieve sharp focus and a good composition



Assignment

angle and the telephoto of thinking that the wide angle is to take in lots and the telephoto is to take you across the street, to close up. But they are graphic tools—they only give you a new viewpoint, a different perspective.'

Sergio shot initially for the location, to establish a sense of place. Then he took in the people, the ceremonies and crowd reaction, and finally he looked for portraits and close-ups of detail.

A skill he recommends is to learn to



Guitarist This young man was quite pleased to pose with his proudest possession. Sergio found the participants most cooperative

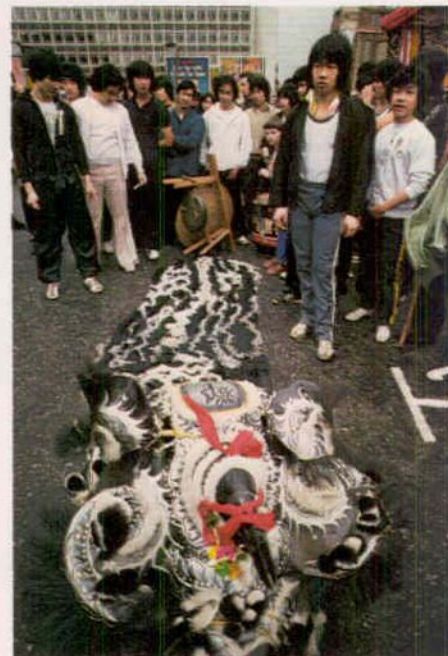
Lion with goldfish bowl This close-up was possible as Sergio was within the enclosure. It was taken with a 105 mm telephoto lens

Lion on ground A 20 mm wide angle lens was used for this shot of the lion dancers ranged around one of the lion costumes

Spectators In shooting for crowd reaction, choose a specific face to focus on so that the image has a point of particular interest



load your camera in the dark. Then you can easily scan for shots while loading your camera without looking—and you lose no time hovering in doorways and assuring yourself that your film is winding on properly. Sergio emphasizes that you can preset your shutter speed and aperture, particularly when so much is happening all at once, and then just check from time to time for your average exposure. Then you need only keep your camera at the ready.



Sergio Dorantes



Creative approach

Rural landscapes

All photographers, amateur and professional alike, tackle landscape photography at some point, but so many amateur efforts fail to make best use of the surroundings

When your holiday photographs are developed, do you ever wonder what happened to those glorious, sweeping views, those majestic, rolling landscapes? Did they really look so insignificant? Somehow, your memory and the picture do not agree.

Amateur landscape photographs are often disappointing. It is not the choice

of subject that is usually at fault, but the conditions under which the subject was photographed. Professionals can wait for hours for a particular light, perhaps returning to the same spot day after day until they feel the conditions are perfect for the right picture. The amateur cannot usually afford such luxury and having found an attractive

view snaps and moves on. But with careful forethought and an understanding of those elements which can really help to make your picture distinctive, you can avoid more disappointing photographs.

Light and weather are the landscape photographer's two most valuable and creative tools. A landscape can change dramatically when illuminated from different directions and it is well worth observing exactly how the look of the land alters as the sun moves in the sky.

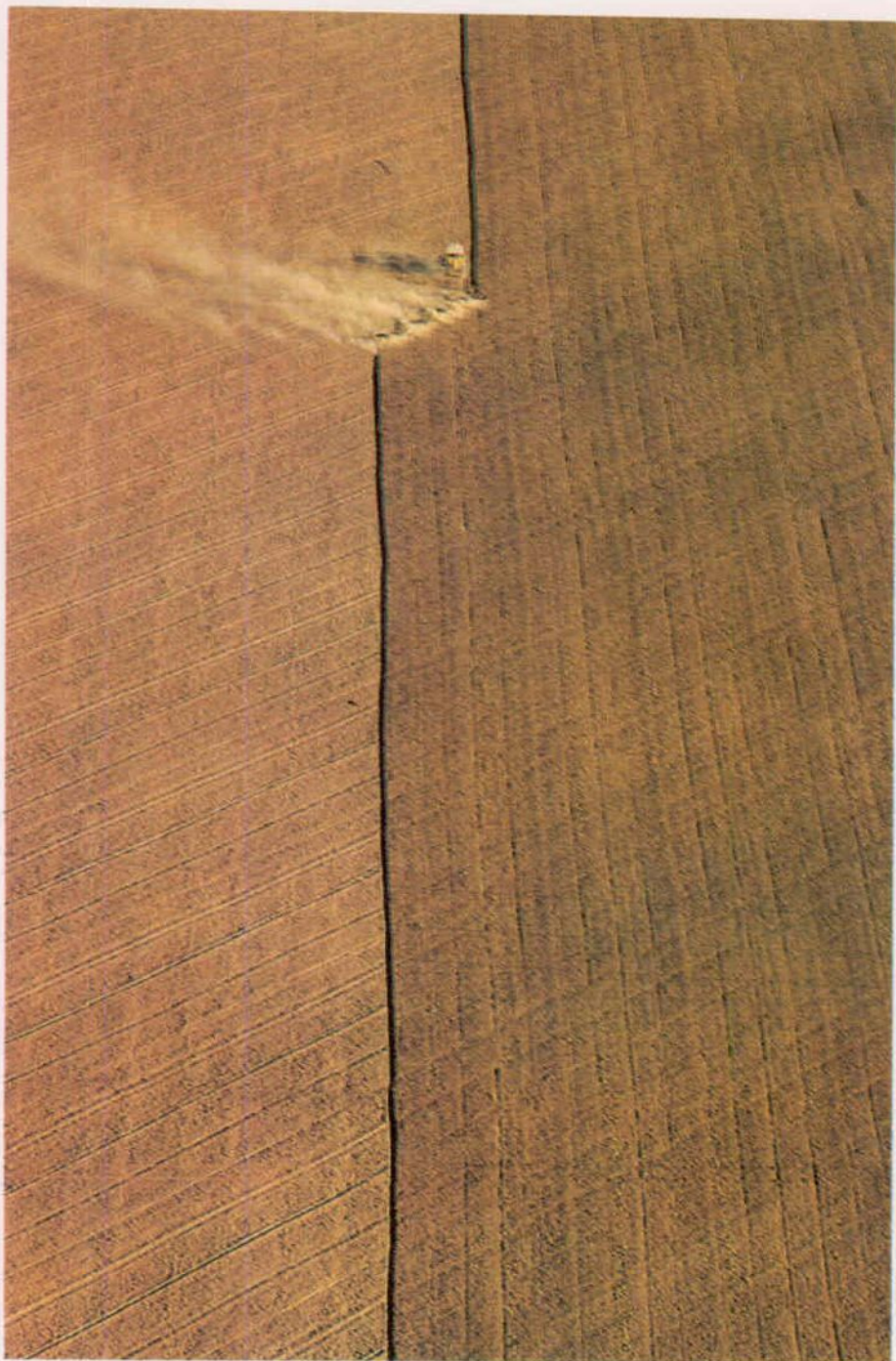
Early morning and late evening are the times favoured most by landscape photographers. Shadows are softer then than in the middle of the day, and the warmer tones help to accentuate the form and texture of the land. Early morning light is particularly attractive when accompanied by a hazy, translucent mist. Think of a field full of sheep on a cold winter's morning. Nothing very remarkable to photograph, but the same scene photographed in a thick dawn mist could be an entirely different prospect. The sheep become ghostly figures, hardly discernible in the gloom, creating a haunting, more memorable image. Remember that you do not have to record factually every detail you see — your picture may have more impact if you hint at what is there instead.

The weather obviously has an influence on the quality of light. Bright, sunny days will cast more shadows, whatever time of day it is, while grey overcast days may tend to make your pictures rather flat and lacking in depth.

As a general rule, exaggerated weather conditions will probably produce the most dramatic shots. Some of the best landscape pictures have been taken in atrocious weather and even the most disappointing views can look considerably more exciting in a storm or in frosty weather. Use adverse conditions to show up the real bones of the country.

Learning to manipulate the light to improve your picture takes a good deal of experience. One of the most spectacular ways of using light in landscape is to shoot into the light itself. This may present some exposure problems, but by bracketing the exposure you should produce one image at least that approaches the effect you want. Look, too, for interesting shapes that would look effective in silhouette form and choose a vantage point that sets the subject against the light in the most original way.

Aerial view *This shot of a tractor tilling an American field makes very effective use of rural patterns. Its success lies in careful composition*



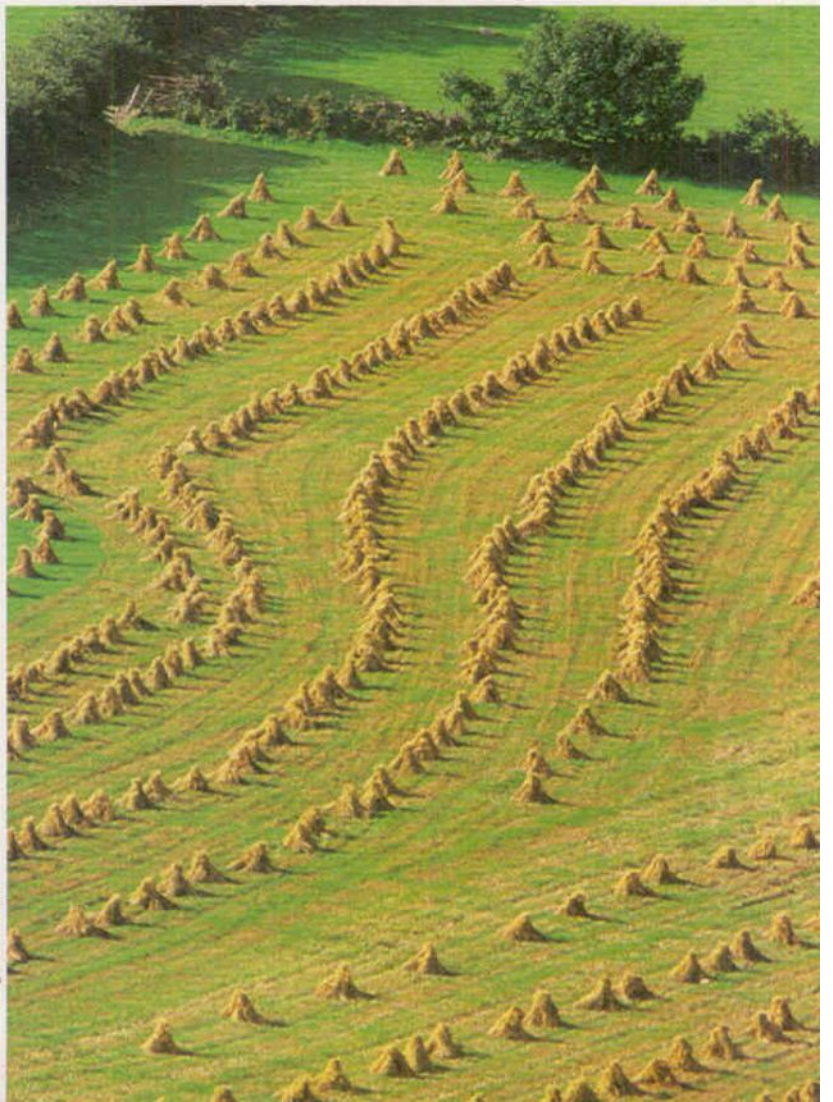
R. Yoshimura/Orion/Vision International

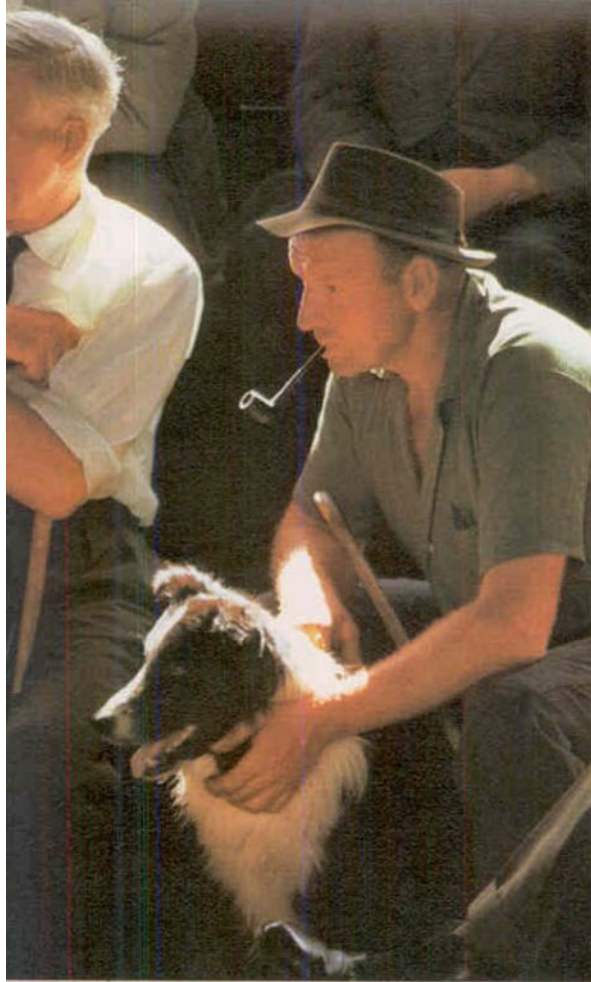


John de Visser



Sergio Dorantes





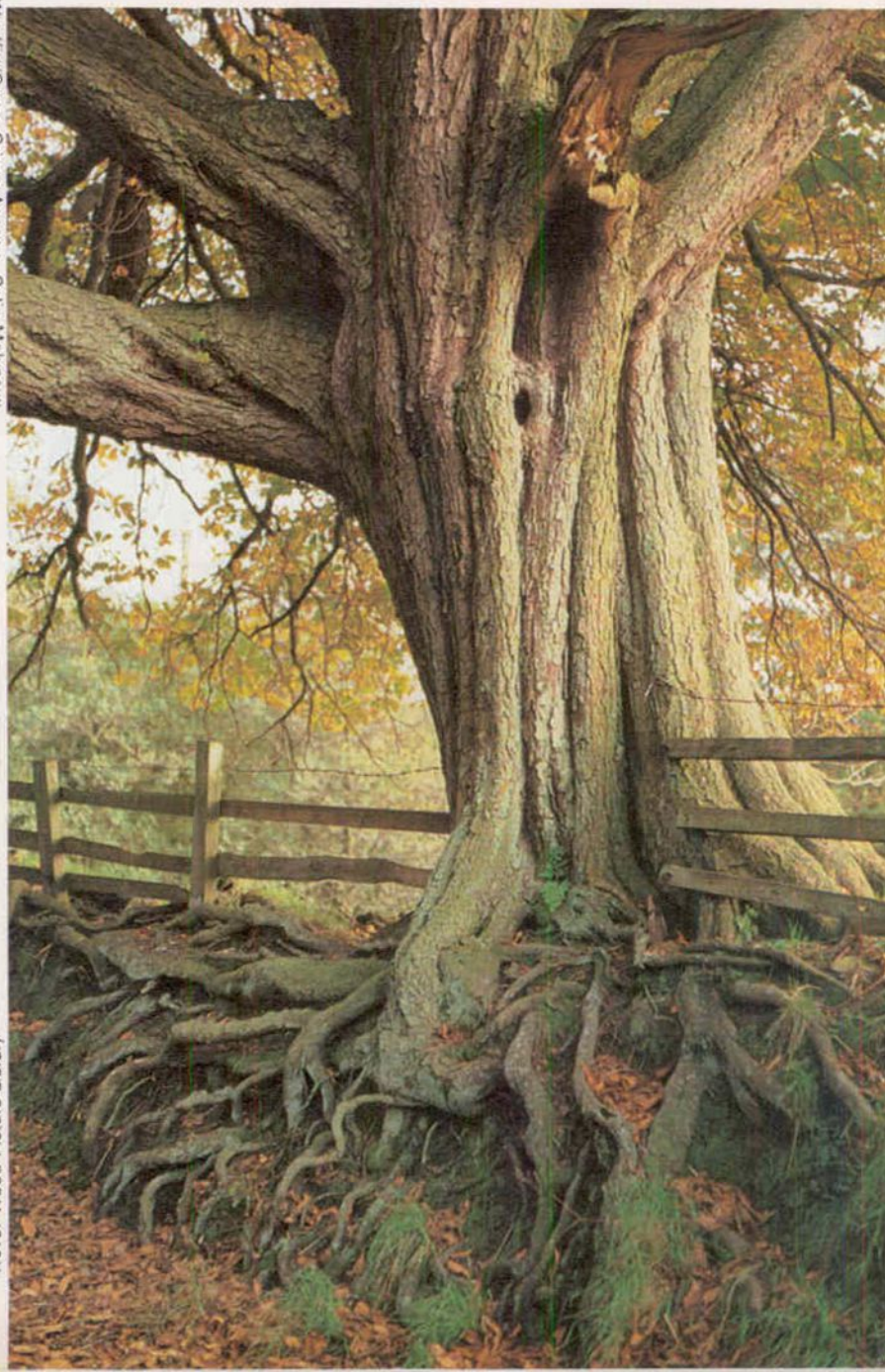
Dumontier/Atlas Photo

Adam Woolfitt/Susan Griggs Agency



Colin Moynaux

Trevor Wood Picture Library





Stone boathouse *This lovely lakeside scene benefits from having a building included. It adds a point of interest and features some local stonework*

If you would like to do more landscape photography, but can never actually get started, it might be a good idea to set yourself a project. One idea is to choose a river and spend a day tracing its course, using it as a base from which to explore all the photographic possibilities as you go along. You might find a map useful, the kind that shows contours clearly, so you can work out where the best vantage points are likely to be. It is even worth considering spending a few days simply exploring a particular area to find the most suitable and attractive locations, spending time searching for the best viewpoint and thinking about the mood you wish to create.

The mood will largely depend on the kind of landscape you are going to photograph. It could be the traditional panoramic 'vista' type scene, the picture post-card variety, which embraces a wide area and can instantly give the viewer an impression of its beauty. Or it could be a smaller rural scene, depicting a part of farm life. You may prefer to close in on a subject, perhaps a group of animals grazing or an unusual pattern within the landscape.

It may be the beauty of the area you wish to capture, or the feel and style of an area, perhaps its characteristic boundary walls or unique farm buildings.

Composition in landscape is almost as important as lighting and weather. Knowing when things 'look right' is largely a question of experience, but a good way to develop your sense of composition is to study good landscape paintings, and see exactly why they work. The crucial balance is a complex combination of the right relationship between a number of elements like light and shade, different colours and proportion of foreground to sky. Try looking at a photograph that you instinctively feel does not look right and see if you can pinpoint the elements that seem to throw the picture off balance. Perhaps it is a tree that detracts too much from the main subject, diverting the eye

and causing confusion. If you can identify the particular aspect that is working against the balance, you are on the way to creating well composed photographs of your own.

One of the advantages of landscape photography is that its more static nature gives you more time to spend composing each shot carefully and choosing what appears within the frame. Before you press the shutter, train yourself to glance around the edges of the frame to make sure unwanted telephone lines or electricity pylons have not crept in and spoiled your picture.

One of the first decisions you will need to make regarding composition, particularly in the panorama type photograph, is where to put the horizon. The traditional choice is to have the sky take up two thirds of the picture, but this is by no means the rule. If the sky is particularly dramatic, a low horizon might enhance the picture. Similarly a low horizon will

Terraced fields *The landscape varies widely throughout the world. If you travel abroad you should try to add a sense of place to your landscape*



Lee E. Battaglia/Colorific

accentuate the dominance of a sky in a particularly flat region. A very high horizon, on the other hand, might be more appropriate if you wish to show the patterns of the land. As always, the only way to know what is best is to experiment with the viewfinder. Move it around, stand on a wall, crouch down low and see what is most suitable.

If the sky is rather bland, a polarizing filter will darken the sky tones without affecting the other colours. If shooting in black and white, a yellow, orange or red filter will increase the impact of a weak sky, darkening it to contrast dramatically with white clouds.



Steve Harr/Vision International

Bare tree *A landscape does not have to include a wide view. It is equally effective to concentrate on a narrower area if it gives a feel of the region*

just wandering around haphazardly, hoping for a few pictures.

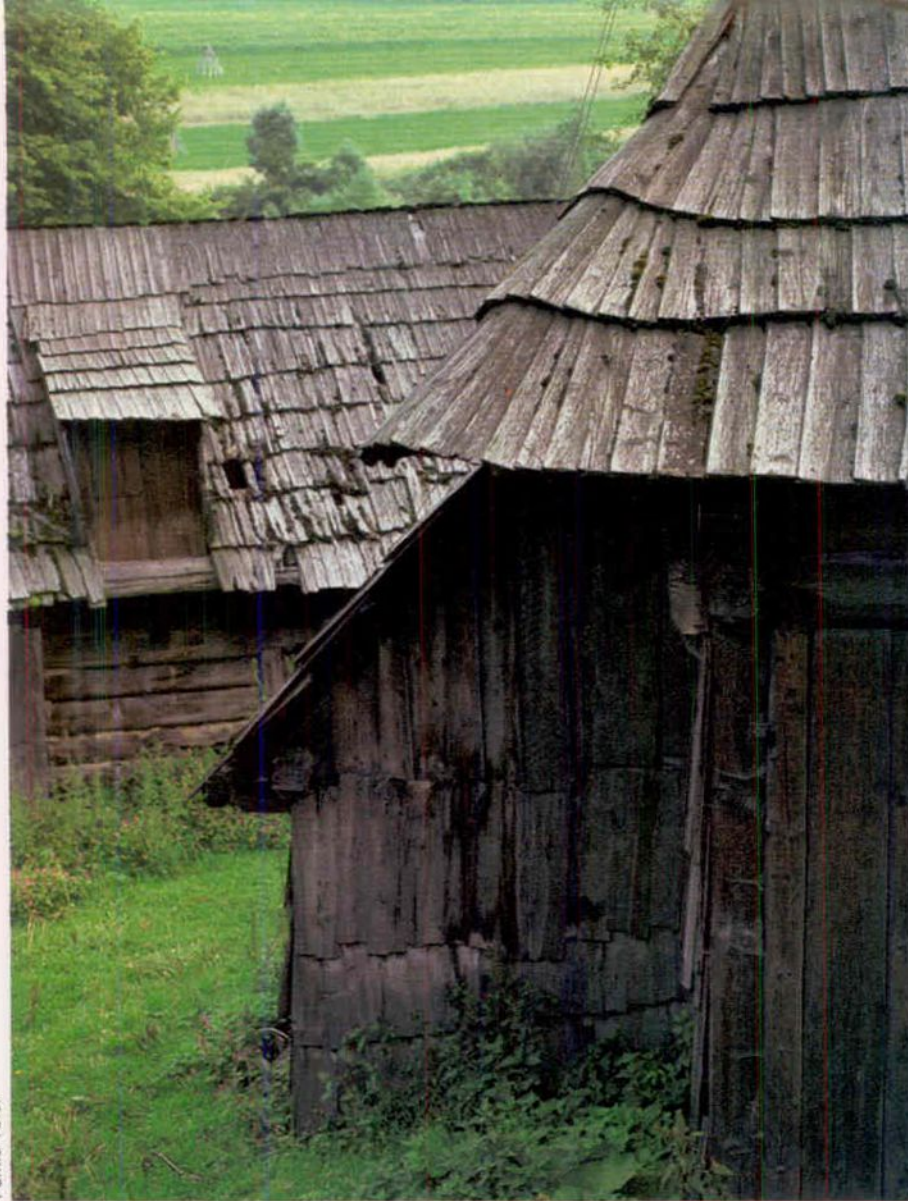
Sometimes you may become engrossed in the composition and overall view of a subject that it is easy to gloss over the other interesting elements in the viewfinder. Seek out rich textures and interesting patterns that small portions of the whole scene can provide. Move in close to the textural surfaces of the soil, stone or rock formations as well as plant life itself. Look for patterns in light and shade, furrowed field, walls, the contours of land, colour relationships and the shapes of trees.

As far as equipment is concerned, there are no rules for the landscape photographer—most professionals working in this field have their own individual style and approach. You will almost certainly find that a tripod is useful, particularly in low light when you want to retain relatively small apertures and wide depth of field.

You can take an excellent range of photographs with a standard 50 mm lens, and if you have one, a medium telephoto around 105 or 135 mm to help you bring subjects closer and fill the frame. Longer focal length lenses tend to compress the distances between separate planes at distant viewpoints and you sacrifice depth, but of course you are able to magnify the subject. Some landscape photographers consistently work with lenses of around 300 mm, ideal for intricate patterns and rich textures.

When it comes to selecting film, you may decide that colour is the obvious choice. Certainly most professionals do work with colour transparencies but do not dismiss black and white too easily, as some really striking results can be achieved. When light is low, or if you want to achieve a particularly grainy effect, use a fast film.

All you can do now is start walking! The beauty is there—it is up to you to make the most of it.



Pamela Toler

Timber barns A building does not have to be kept in the background. Sometimes it helps to compose a landscape so that buildings dominate the scene

Another way to enhance your picture is to change your viewpoint and include a building somewhere in the picture. The eye will be drawn to it, as a point of interest, yet will take in the beauty of the scene too. It could be a single cottage, a hay barn, even a small cowshed, but its strategic placing within the overall composition can dramatically alter one's appreciation of the scene.

If your chosen theme is farmland, it should be easy to anticipate promising shots by learning about the farming calendar and talking to the farmer himself. Make it your business to find out when the lambing season begins, for instance, or when sheep shearing is to take place. Perhaps interesting new machinery is being delivered or installed. Get to know when ploughing, ditching, furrowing or planting takes place, work out your best vantage point and equipment needs before the event and make the most of the session. You will save a good deal of time and wasted effort and feel far more professional than

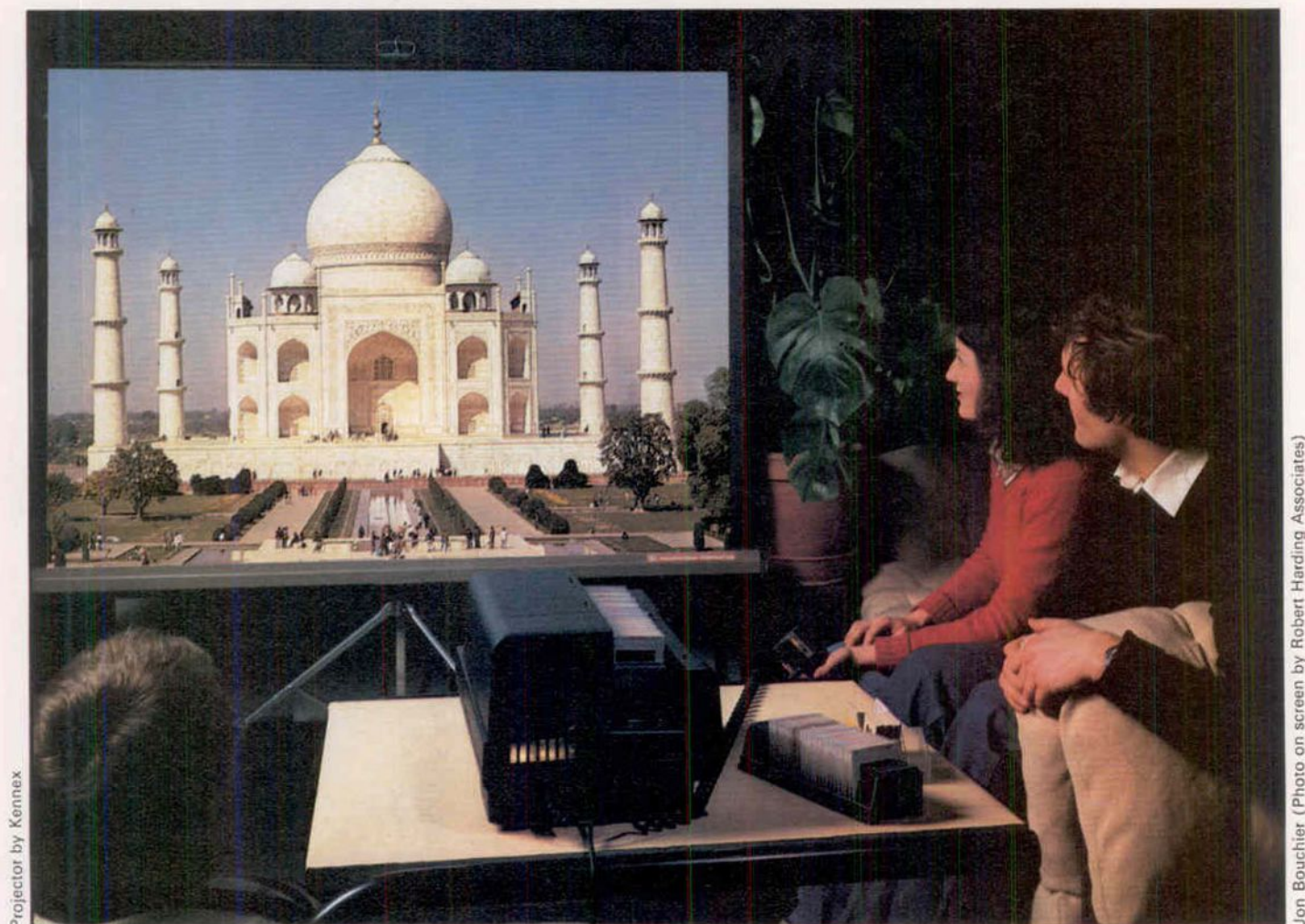
Grazing sheep By combining these New Zealand mountains with a field of sheep this landscape has plenty of interest. The sky and the light also help the shot



David Moore/Colorific

Slide projectors

If you want to show a lot of slides to a large group of people, a projector is essential. Many modern projectors are now fully automatic, but cheap, simple ones often do the job just as well



Projector by Kennex

Jon Bouchier (Photo on screen by Robert Harding Associates)

The first widely available colour film produced colour slides which had to be viewed by transmitted light or projected onto a screen to be seen clearly. Although nowadays colour prints are much more popular than transparencies, colour slides are still widely used, and the need for projection remains.

Colour transparencies offer a number of significant advantages over colour prints, which have been covered in another article (page 160). Many photographers prefer to use slides because the quality of the colour is better and they are in some respects easier to print at home than colour negatives. Professionals like to use them because they give better results when printed in a magazine or book. Most of the pictures in *The Photo* are reproduced from colour transparencies, many of them of the standard 35 mm format.

Basic features

A slide projector is essentially an enlarger turned on its side. It has a light source to illuminate the slide, condensers to concentrate the light into a narrow beam, a carrier to hold the slide, and a lens which can be focused to throw an enlarged image of the slide onto a screen. All slide projectors have these same features and differ only in the degree of automation with which the slides are projected.

The lamp in almost all slide projectors that are currently available is a low voltage quartz halogen type. The lamp normally takes 24 volts and is fed with power by a transformer which is built into the body of the projector. It generally has an output of 150 watts, but some projectors are available in a higher power version, usually 250 watts, for use in large halls.

Projector bulbs get extremely hot in the course of operation. All but the cheapest projectors have a fan to draw air over the bulb and cool it down. The most basic type of projector relies on convection currents to cool the bulb, but this method is not as satisfactory as a forced supply of air.

Light from the bulb is reflected forward by a concave mirror. This is often specially coated to reflect only visible light and to absorb infra-red radiation, which would otherwise heat the slide in the gate. This keeps the operating temperature down.

To produce a concentrated beam of light, all projectors incorporate two or more condenser lenses. These collect the light from the bulb and reflector and focus it in the projector lens. Somewhere in the light path, usually between the condensers, there is a heat filter. This

performs the opposite function to the reflector, allowing visible light to pass through, while stopping infra-red.

The lighting system of a slide projector is very much the unglamorous side of the machine. Unfortunately, it is often overlooked by potential buyers because it is concealed inside. The quality of the light system decides how well the projector will work. A cheap optical system which uses unsuitable condensers, and perhaps an inadequate fan, can lead to uneven screen illumination with dark corners, and also to premature bulb failure. Since replacement bulbs are very costly, a cheap projector can turn out to be a false economy in the long run.

Immediately in front of the condensers is the slide carrier itself. The design of this varies considerably. Different projectors use different methods of positioning the slide for projection and holding it steady once in place. All 35 mm slides are mounted in holders which are 50 mm square, so the slide gate is always made to fit this standard size.

The slide carrier should be kept cool, because if the slide gets too hot during projection it can buckle in the heat. This is known as popping, causing the slide to go out of focus on the screen. Extremes of temperature can lead to permanent damage of your slides.

A specially computed lens forms an image of the slide on the projection screen. The standard lens for 35 mm projectors usually has a focal length of 85 mm and an aperture of $f/2.8$ or $f/2.5$. The lens is mounted in a threaded tube. Turning the lens moves it closer to the slide in the gate or further away from it. This focuses the image on the screen and allows the projector to be used in rooms of various sizes.

At a distance of three metres, an 85 mm lens forms an image that is 1.2 metres in width, if the slide is horizontal. If a larger picture is needed, a lens with a shorter focal length provides greater enlargement without moving the projector away from the screen. Most projector manufacturers make a range of lenses. Longer focal length lenses are useful for projection in large halls where an 85 mm lens would form an image which is too big. The chart on this page shows how far apart the projector and screen must be placed when using different focal length lenses, if the projected image is to be 1.5 metres wide.

If it is likely that you will be using the projector in many different size rooms, a 'zoom' projection lens makes it easier to frame the image to fit the screen. These lenses are not, strictly speaking, zoom lenses as they need refocusing each time the focal length is changed, but they can sometimes eliminate the need to buy different lenses for large and small rooms.

In recent years, considerable effort has gone towards making projectors more automatic in operation. Both transporting the slides and focusing the lens can now be done automatically. All complex mechanisms are necessarily

Lamp changing *This projector has an easily removable cover that makes changing the bulb an easy matter*

Projection distance *In large halls, long lenses must be used, or the picture is too big. To find the lens needed for a 1.5 m wide image, read the projection distance on the left, and where this meets the red line, look down to read the focal length on the bottom scale of the graph*

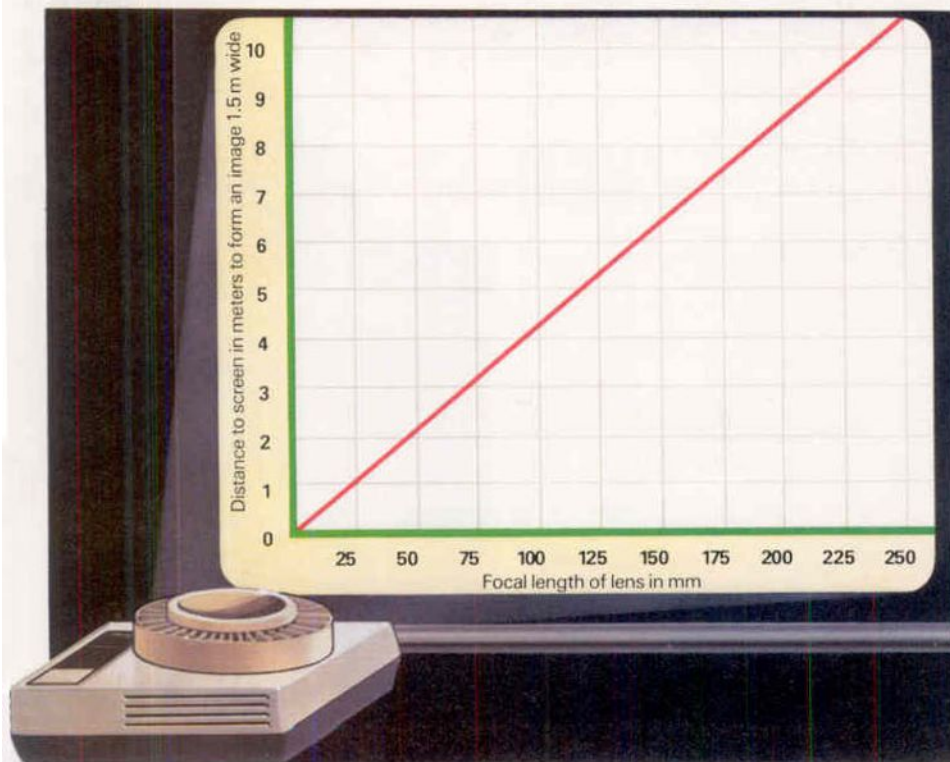
expensive, though, and many people are perfectly happy with a simple projector and neither want nor can afford the sophistication of a fully automatic model.

Slide changing

The simplest slide changing mechanism is a metal carrier with two apertures to hold the standard 50 mm square slide. The carrier slides back and forth in front of the light source. While one slide is being projected, the opposite end of the



Jon Bouchier (Projector by Braun)

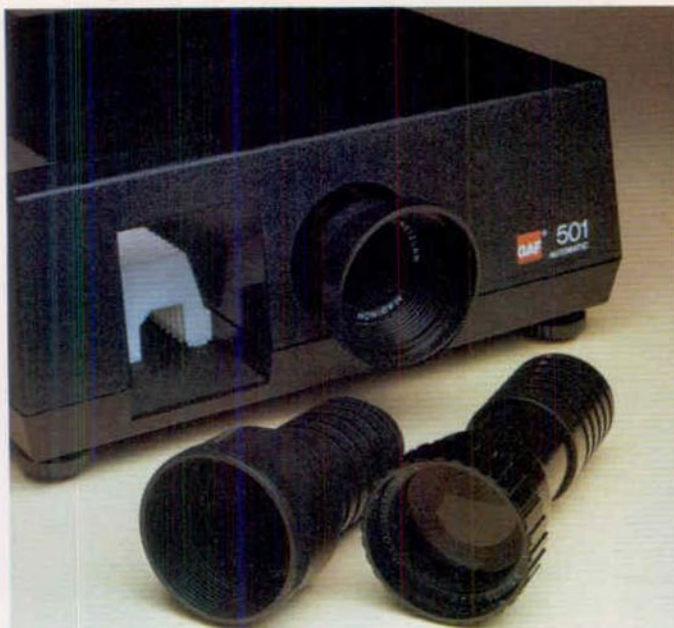


carrier protrudes from the projector so the other slide can be replaced by a new one. Only the simplest projectors use this shuttle change system, but it does have the enormous advantage of being foolproof and unbreakable, while many of the more complex slide changing systems are prone to jamming and sticking. On the negative side, slide changing has to be done manually. This is tedious, and a slide can easily be wrongly inserted in the dark.

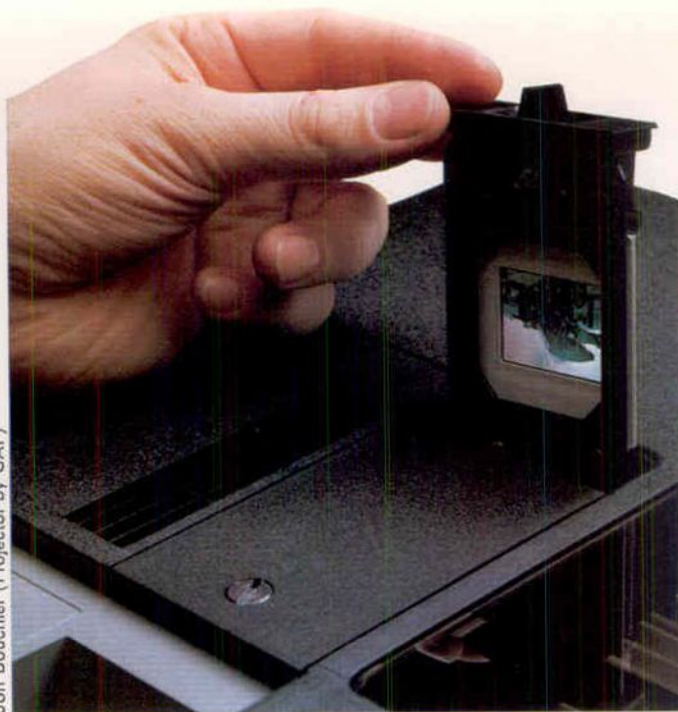
Most projectors use magazines. These are made of plastic and are loaded before the slides are to be projected. This is a more satisfactory system, as you can examine the pictures and plan the show at your leisure, instead of scrambling round in the dark.

There are two basic types of magazine: straight and rotary. In straight magazines, the slides are lined up in a row in individual slots. As the slides are changed, the magazine moves forward so that a new slide becomes available. A rotary magazine is similar, but the slides form a circle and the capacity of the magazine is higher. With the rotary magazine continuous shows are possible, which is convenient for automatic

Advertising Arts



Projector lenses Most projectors have a choice of lenses. The 60 mm lens on the left forms a bigger picture than the 85 mm on the projector at the same projection distance. The 'zoom' lens on the right gives a variable picture size



Jon Bouchier (Projector by GAF)

Slide editing If a slide is loaded into the magazine the wrong way round or upside down, it is possible to lift it out and correct it when using this projector. This useful feature also lets you project single slides

Slide-tape presentations

Slide projection does not have to be confined to a series of images projected individually, with a spoken commentary. Most slide projectors which have a socket for a remote handset can also be operated by electronic devices which change the slides automatically.

The most common way of using this facility is to record pulses onto ordinary magnetic tape which, when the tape is replayed, change the slides at preset points. Using a stereo taperecorder, the other channel can be used to record a sound track or a 'voiceover'—a spoken description of the slides on the screen, or remarks to clarify what is seen.

Using a slide projector and tape recorder combined in this way is called audio-visual, or slide-tape presentation, and makes slide projection much more versatile. Although in its most simple form, slide-tape features need only one projector and a tape recorder, many photographers use a slightly more sophisticated set up. This uses two projectors, and a device which makes it possible to dim the image of one of them while the image from the other projector is made brighter. By careful superimposition of the two images, the impression is given of one image dissolving while the other one appears. This eliminates a dark gap between slides and lends a professional gloss to the show.

When purchasing a projector it is worth bearing this possibility in mind, and finding out whether the machine you are thinking of buying can be used with a slide-tape synchronizer.

Often, a projector with this facility costs no more than one without it, and there is little point in buying a model which limits the further development of your photographic activities.

displays and presentations in shops, museums, and craft exhibitions.

Different manufacturers produce different types of magazine, although there is a degree of standardization in the case of straight magazines. When buying a projector, ask the price of extra magazines. If they are cheap, use them to store slides between shows.

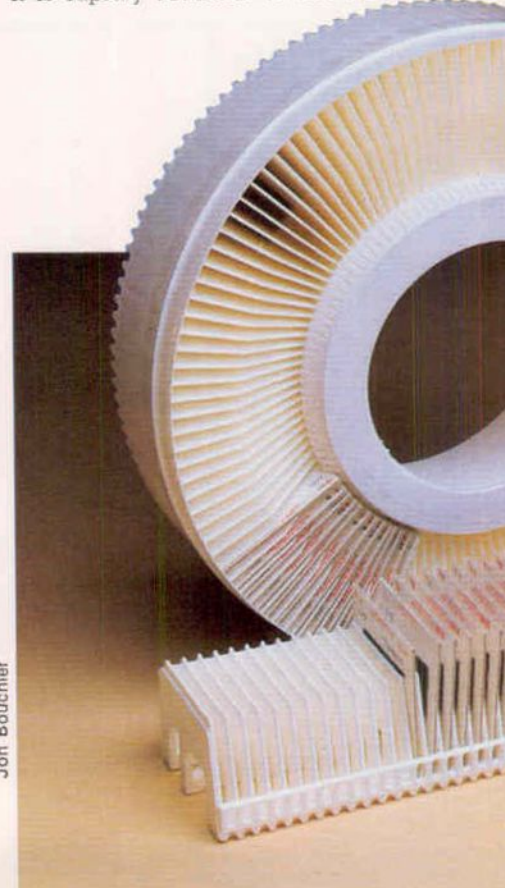
A variety of mechanisms are used to get the slides out of the magazine and into the gate of the projector. Some projectors use a gravity feed mechanism with the tray of slides on top. This has proved a simple and reliable system and less prone to jamming than most other mechanisms, but the projectors are quite expensive.

The alternative which other manufacturers have adopted is a sliding or swinging arm that pushes the slide into the gate. This is done manually on the cheaper magazine loading projectors and the user slides a knob in and out, but even on quite cheap projectors a motor does the job instead. The 'command' to change the slide is given by pressing a button either on the projector, or on a separate remote hand set. The slide is removed from the gate and replaced in its slot in the magazine, which then advances to the next slide. This in its turn is removed from the magazine and inserted in the gate.

Focusing

Since different types of slide mount hold the transparency in slightly different positions, a tray of mixed slides often needs constant refocusing. This can be irritating if you are not near the projector, so projectors often have a motor operated focusing device, which by pressing a button on the handset or sliding a switch, causes the lens to be

racked back and forth. When correct focus is achieved, the button is released. Even this small task is made unnecessary on the most expensive projectors, which have automatic focus maintenance. Once the first slide in the magazine has been focused, the projector automatically adjusts to focus all the others. This is done by clever arrangement of photocells and an infra-red beam, which is bounced off the slide in the gate. The focus adjustments are made almost instantaneously. Even when a slide pops, it is rapidly returned to correct focus.



Jon Bouchier

This feature is very useful, and definitely worth paying extra for.

Which model to buy

When comparing projectors, remember that all projectors perform basically the same function, regardless of price. A very elaborate automatic projector probably produces a picture on the screen that is completely indistinguishable from that produced by a projector costing only a fifth of the price.

Paying more for a projector does not necessarily mean better quality. It does often mean more features, though there are exceptions to this rule. Some of the very expensive models which are designed for continuous running in audio-visual displays have few extra features, but they are very solidly built.

There is no substitute for actually going and looking at projectors if you can. Although it is often cheaper, buying by post can lead to disappointment. Advertising brochures give only an idea of appearance and specifications, and rarely an indication of what the performance of a projector is like.

Take a decision about what type of projector you want—auto, manual, or semi-automatic—before you start comparing the different models on the market. Decide also whether or not you need auto focus or remote focus. If you take basic decisions like this quite early on, the wide range of projectors on the market is less likely to confuse your choice of model.

Do not buy a projector without trying it out, or at least trying an identical one. Take a selection of your own slides to the shop, including a very thin slide mount and a thicker one, since some projectors jam easily on the two extremes of slide thickness. Ask the assistant to show

you how the bulb is changed. On many projectors this is very difficult and involves removing the whole projector casing. Since projector bulbs usually blow in the middle of a slide show, the process of changing bulbs is complicated still more by the area around the bulb being very hot indeed. The most modern projectors sometimes have a standby bulb which can be quickly swung into position, but this is not a common feature.

It is difficult to judge the quality of a projector lens merely by looking at the image that it forms unless a special test slide is in the gate of the projector. Some high quality projectors are actually supplied with such a slide. Unfortunately, such self-confidence is rare. A poor lens will not resolve fine detail in the corners of the picture. Slides often suffer from distortion, so that straight lines in the original slide appear bowed either in or out. Further faults include inadequate coverage, where the corners of the

projectors with a sound track recorded on tape is quite important. It can add life and pace to an otherwise mundane show (see opposite). Almost every projector that has a remote control socket for slide changing can be used with a synchronization device. Those that do not may be adapted to accept the necessary inputs to fade the slides and change them at the right moment.

Other points to look for include *infrared remote slide change*. This is a cordless handset similar to a remote control for a television. *Variable light intensity* allows the bulb to be dimmed to suit the level of ambient lighting, and incidentally can increase the life of the bulb. A *safety cutout* switches off the projector if a slide jams in the gate. A *slide timer* changes the slides at preset intervals. A small lamp incorporated in the remote handset projects an *arrow pointer* onto the screen to draw attention to objects in the picture. With a *single slide projection/edit facility*, the slide being



Jon Bouchier (Handsets I-r GAF, Kennex, Braun)

Round and straight slide magazines

Straight magazines have a low capacity, but are often of a standard design. Round magazines hold far more slides, but are rarely standardized—and may be more expensive

Remote control Handsets vary from basic, which only has forward, reverse and focus (front) to total control (back). This one also has dimmer, timer, autofocus on/off and preview screen. The cordless unit (right) uses infrared pulses

picture appear cut off, and vignetting, when there is a hot spot in the centre of the picture. Vignetting can also be caused by a badly designed condenser system or a wrongly aligned lamp.

Trying out a projector also gives an indication of noise levels. An induction fan can be very noisy, particularly in a small room, and the changer itself can make a noisy clatter.

Optional extras

Minor selling points usually separate similar models in the range of any one manufacturer. Most of these small features are quite insignificant details, but the ability to synchronize one or more

projected can be lifted out of the gate, if it is accidentally loaded into the magazine upside down or back to front, and reinserted correctly. This feature is also useful for showing individual slides, since it makes loading into a magazine unnecessary. A *preview screen* is a small, slide-sized screen, lit from behind, that allows you to examine a slide in the dark without lighting the whole room.

All these facilities are useful from time to time, but are hardly essential to the smooth running of a slide show. They might, perhaps, be the only difference between two otherwise identical projectors. Choose your projector for the features that suit your needs.

Wide angle distortion

Wide angle lenses make it possible to take photographs in very confined spaces, but they must be used with care if the subject of the pictures is not to look unnaturally distorted on the final print

For certain shots in certain situations, your standard lens may not give you a sufficiently wide angle of view. To include all of the subject in the frame, you may need to use a lens with a short focal length—a wide angle lens. But you must use it carefully if you are to avoid the unnatural looking pictures that these lenses can give.

Image distortion

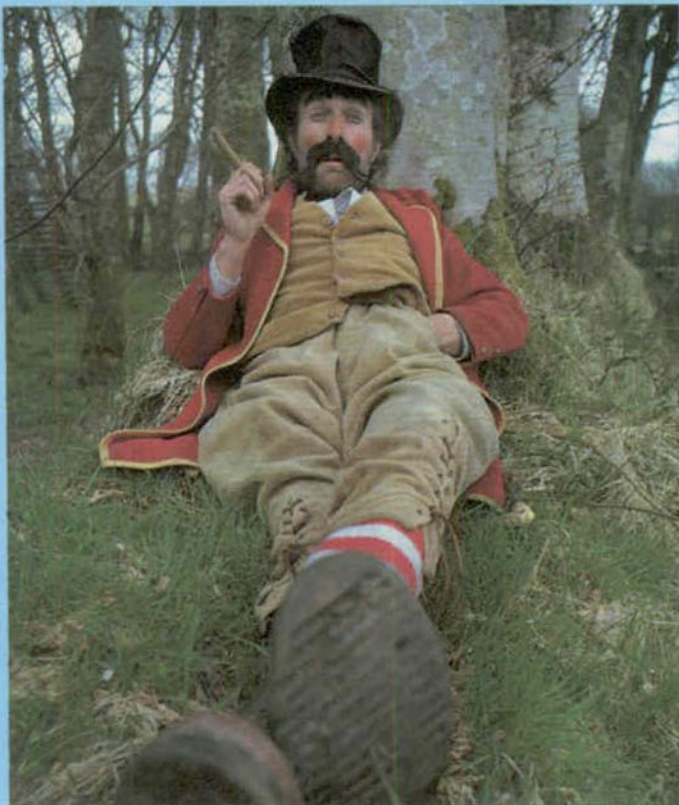
Wide angle lenses are often said to produce distortion. Four different kinds can be identified although, strictly speaking, only one of them is really distortion caused by the lens itself. This is a type of curvilinear distortion called *barrel distortion*. This causes straight lines near the edges of a picture to bend outwards in the middle, giving the bulging shape of a barrel.

An extreme example of barrel distortion is that shown by a fisheye lens, where rectilinear projection is sacrificed to achieve an angle of view of 180° or more.

You may come across slight curvilinear distortion with some less expensive wide angle lenses and certainly the shorter the focal length the greater the likelihood of the fault. Even with a high quality lens of say 24 mm focal length, some bending of straight lines may occur but you would not normally notice it unless there are some strong straight lines near the edge of the picture.

Converging verticals

When you are using a wide angle lens to photograph the whole of a building from fairly close to, tilting the camera slightly upwards to include the roof will produce violently converging verti-



Big feet Filling the frame by getting close to the subject often leads to exaggerated perspective. Close viewpoints cause this, not lenses

cals in the picture—that is, the building will narrow unnaturally towards the top. Tilting the camera slightly downwards in photographing a room interior will give the same effect but this time the vertical lines converge so that a door looks much narrower at the bottom than at the top of the frame.

These effects have nothing to do with the lens at all but are examples of the steep perspective caused by close viewpoint. A pinhole camera will give exactly the same results from the same view-

points. If you stand fairly close to a tall building and look up at it you will see the converging verticals in the same way as a camera, but your brain interprets the messages sent to it by the eyes, and because it knows that a building has vertical walls the convergence passes unnoticed.

Similar examples of abrupt perspective occur when a portrait is taken from fairly close to the model. Parts of the face nearer to the camera than the rest, such as the nose and chin, look unnaturally big and a more distant ear may look too small. A short focus lens encourages such close viewpoints because of the smallness of the images it gives from further away. It is important to remember that the perspective that will be seen in a photograph is exactly the same as that which will be seen if the eye is placed at the position of the camera lens when the picture is taken.

Romany family Wide angle lenses distort objects at the edges and corners of the frame. The camera records three dimensions on to a piece of flat film, so some parts of the picture are squashed out of shape, as shown in the diagram at right. Keep the main subject central to avoid this





Distortion of shapes

In a wide angle photograph, objects such as human heads and spherical light globes in the corners of the field of view, will be stretched into elongated shapes that can look quite grotesque. Again, a pinhole will give exactly the same result which arises because the image of the subject in the camera is projected onto a flat surface. Despite the wide angle of view of the eyes, we do not see such distortions because our retinas are strongly curved. Some cameras designed expressly for taking very wide angle pictures of landscapes or large groups of people hold the film in a curve to avoid such distortions of shape.

Avoiding distortion

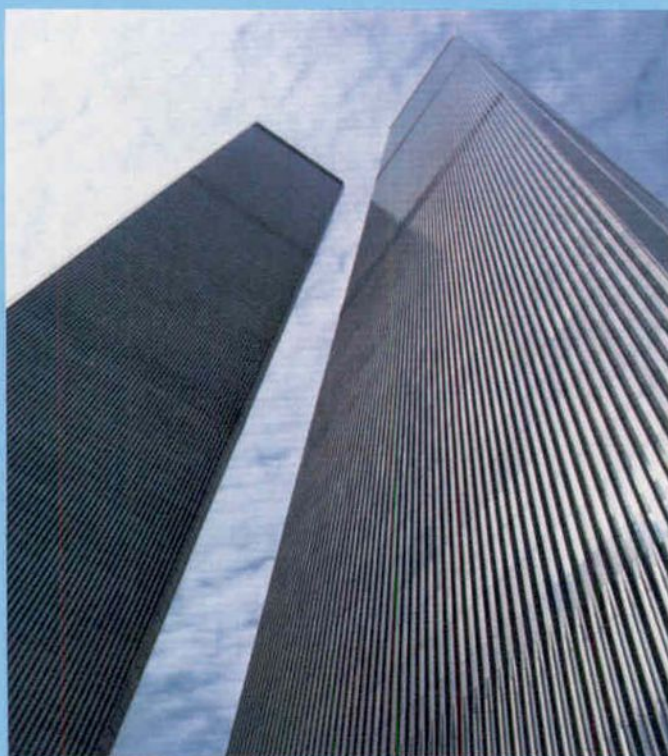
The barrel distortion given by a fisheye lens cannot be avoided, so do not use one if bending straight lines is unacceptable. If a cheap wide angle lens shows uncorrected curvilinear distortion, take care to avoid having straight lines in the subject falling at

Boxing ring A lot of wide angle lenses have barrel distortion. The fish eye lens is an extreme example

the edges of your pictures. It is only away from the lens axis that bending occurs. It is also good sense to buy the best wide angle lens you can afford, especially if you are interested in architectural photography.

Converging verticals can be avoided by making sure that the film plane is always kept vertical. In photographing buildings this is sometimes difficult and for some 35 mm cameras there are perspective control or 'shift' lenses which give the equivalent of the rising and shifting

Tall buildings Tilting the camera up gets everything in, but leads to dramatically converging vertical lines



G. V. Hughes

front found on a technical camera. With such a lens it may still be possible to include the top of a building without having to tilt the camera.

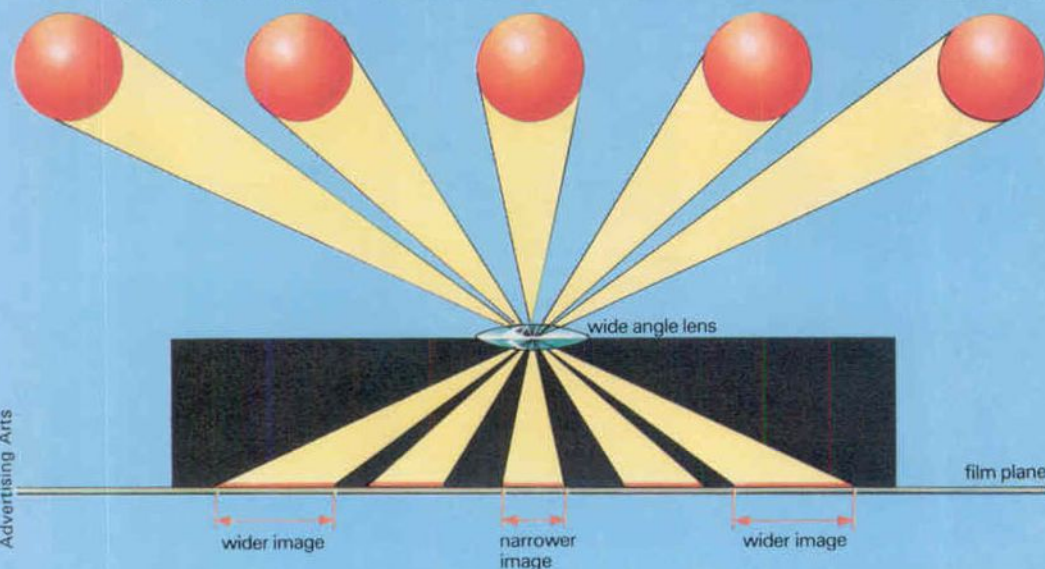
You can prevent the stretching out of faces at the corners of wide angle shots only by keeping people more or less in the middle of the picture. Watch also for other shapes that will look strange if distorted in this way and keep them away from the edges of the frame as far as possible.

For portraits, unless you are trying to caricature your sitters, never take a close-up with a wide angle lens. For more or less formal head and shoulder portraits with a 35 mm camera, a 90 mm lens enables the camera to be kept at about 2 metres from the subject, which is far enough away to give natural looking perspective. Using a wide angle lens at such a distance gives a very small image and a print of reasonable size would involve such a large magnification that objectionable graininess and serious loss of sharpness would be almost inevitable.

Print viewing distance

There is no such thing as 'distorted' perspective. It can look wrong, however, through looking at a print or a picture on a screen from the wrong distance. The right distance for natural looking perspective is the focal length of the camera lens multiplied by the magnification used in making the print or projecting the slide. Thus a negative made with a 24 mm lens and enlarged 7 diameters to make a print 250 mm long should, ideally, be viewed from a distance of about 18 mm—much closer than the eyes can focus. The same picture as a slide enlarged 40 diameters on a screen should be viewed from a distance of a little more than 1000 mm—much too close for comfort. In reality, of course, we see all prints from the same distance, regardless of what is 'right'.

When using a camera fitted with the standard lens of about 50 mm focal length, viewing the finished picture from the right distance for natural perspective may not be so difficult. It is this fact that gives rise to the idea, mistaken as it is, that wide angle lenses distort the perspective of a photograph.



Improve your technique

Black and white filters

Coloured filters for black and white pictures? Knowing which filter to use can make a dramatic difference to your pictures. With the right filter you can completely change the tones of your subject

Filters have always had an air of mystery for the newcomer to photography and often slightly unusual pictures are greeted with a sage nod and a conviction that the photographer must have used 'some sort of filter'. But filters are really very simple and are immensely useful aids to the photographer. With modern black and white films, filters are rarely essential for technical excellence, but thoughtful use of filters can make substantial improvements to the look of a wide range of photographs.

There are a tremendous number of filters for black and white on the market, each with a slightly different effect, and many of them can be used for a wide variety of shots. You can get some idea of the effect of any filter simply by look-

ing through it, but there is no doubt that the only way to learn to exploit filters to the full is to go out with your camera and experiment. Here we can only give a summary of the principle types of filter and a few examples of the effects they can give to your pictures.

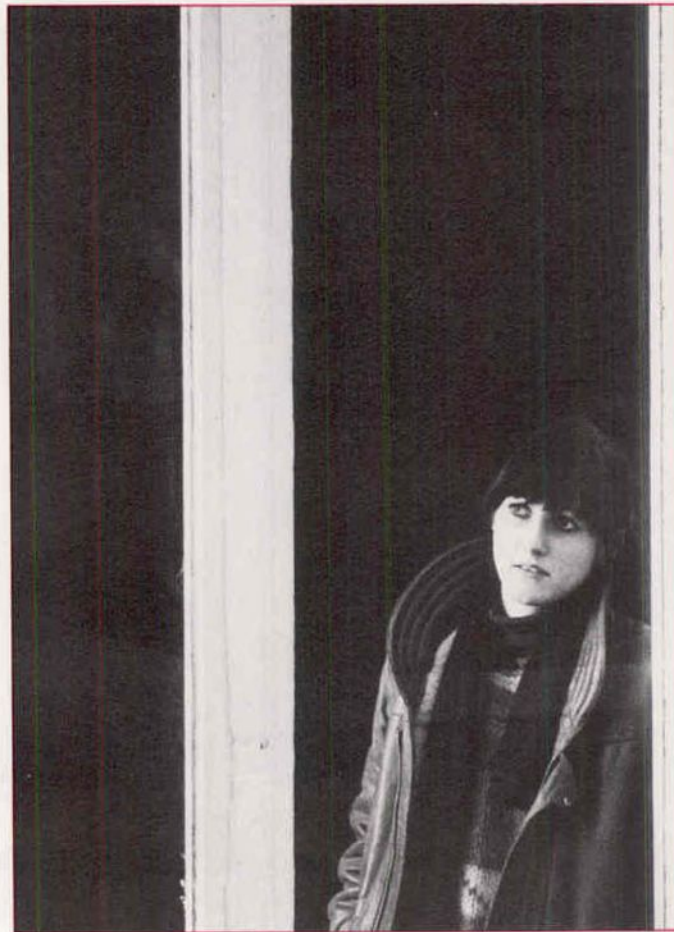
Coloured filters

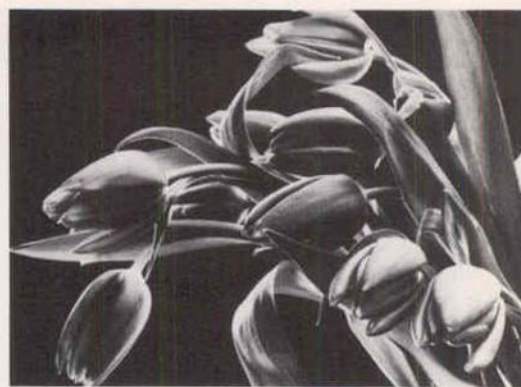
Filters cannot add to the light falling on the film; they can only take away. But they can take away selectively, stopping only certain types of light. And this is what coloured filters do; they absorb some colours almost completely, reduce the passage of others, and allow the rest to pass through virtually unchanged. The effect that a filter has depends on the colours it absorbs.

A yellow filter, for instance, absorbs a great deal of blue light, a little red light and hardly any yellow or green. This means that with a yellow filter in place, very little light reflected from anything blue reaches the film while virtually all the light from anything yellow gets through. Blue objects are therefore relatively darker and yellow objects relatively lighter in the final print than they would be with no filter in place.

Reflections *Careful choice of camera angle makes the reflections into important elements of the composition*

Girl at window *From the same viewpoint, a polarizing filter has suppressed the reflections to change the emphasis*

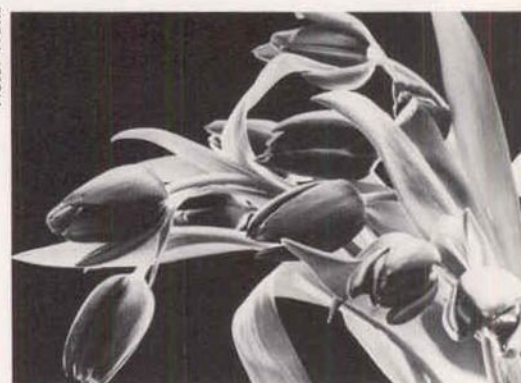




Red filter



Green filter



No filter

Each filter transmits light of its own colour very well while blocking the passage of every other colour in varying proportions. Colours far from the filter colour in the visible spectrum are heavily absorbed while those relatively near are only lightly absorbed.

By careful selection of a filter of the right colour, you can make some parts of the picture darker and other parts lighter at will. Filters can therefore be very useful creative tools. Their main value is perhaps in increasing or reducing contrast between adjacent parts of a scene. If you want to darken a blue sky to contrast with clouds or the landscape, you use a yellow or orange filter of the appropriate strength. If you want a red rose to stand out darkly from its foliage, you put a green filter in front of the lens. A red filter, on the other hand, could lighten red skin blemishes so that they are virtually unnoticeable. The possibilities are endless.

Yellow is used to darken blue skies. It will also improve the contrast of buildings seen against blue sky and will improve the shadow contrast and texture of snow scenes in sunshine. It removes slight haze because it absorbs ultraviolet, as do most other filters. Yellow filters are available in different densities from some manufacturers. Kodak, for example, produce nine filters that are described as 'yellowish' in their catalogue of Wratten gelatin filters, in addition to a range of eight yellow colour

Flowers Red blooms and green leaves (above) as they appear to the eye. The same flowers photographed through a red filter (right), have darker than normal leaves and lightened blooms. A green filter reverses the effect—the leaves are unnaturally light, while the blooms have become very dark. With no filter on the lens, tones are more natural, but not necessarily best



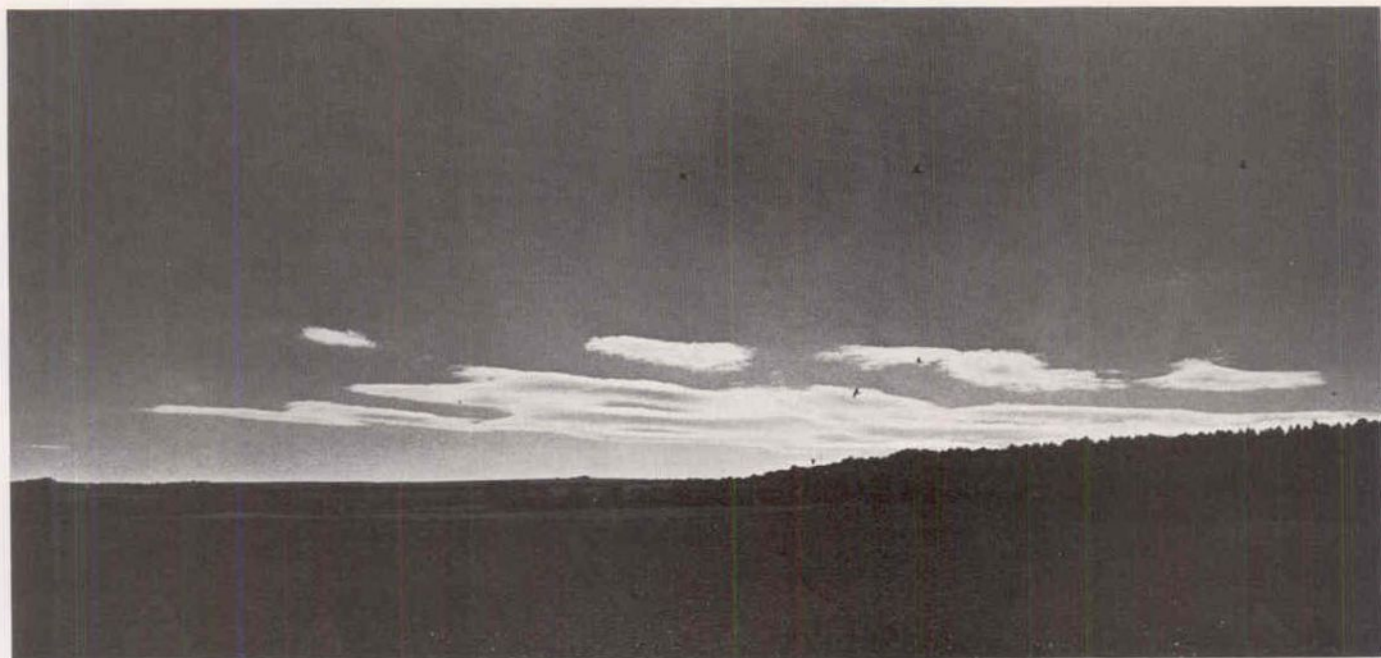
Mark Edwards

compensating filters. The filters that are most often used, however, are the W8 and W15. The W15 is the more versatile, deeper coloured filter. Other manufacturers' filters may not correspond precisely to standard Wratten values. It is best to test your filters by making trial exposures to determine their precise filter factor for your camera and metering technique before you use them for any important pictures.

Yellow comes close to correcting the colour sensitivity of modern black and white film, making it similar to that of the eye. A pale yellow filter meets requirements by darkening blue slightly, but where more detail in green objects is wanted a yellow-green filter can be used. Contrast between red and yellow is increased.

Green transmits one third of the spec-

Grand Canyon The contrast between sky and clouds has been dramatically emphasized with a polarizing filter



John Welmsley

trum and absorbs most of the blue and red, thus lightening green and yellow and darkening blue and red. It is sometimes used by landscape photographers, and also gives richer skin tones.

Orange lightens red, orange, yellow and darkens blue and green. It enhances surface texture of brickwork or stonework in sunlight and renders blue sky (or water) very dark. An orange filter also subdues skin blemishes and freckles. It emphasizes the grain in wood by lightening the pale areas, so increasing the contrast.

Red filters transmit a third of the spectrum, depending on the density of the filter. They absorb blue and green light, darkening those colours to near black and lightening red, orange and yellow. This means that they can often penetrate haze quite effectively.

Blue is the least useful filter, but a pale blue filter can occasionally be useful for taking portraits to reduce the paleness of lips and complexions. A blue filter emphasizes haze in landscapes, but panchromatic film exposed without a filter will do this anyway. There is very little to be gained by using a blue filter.

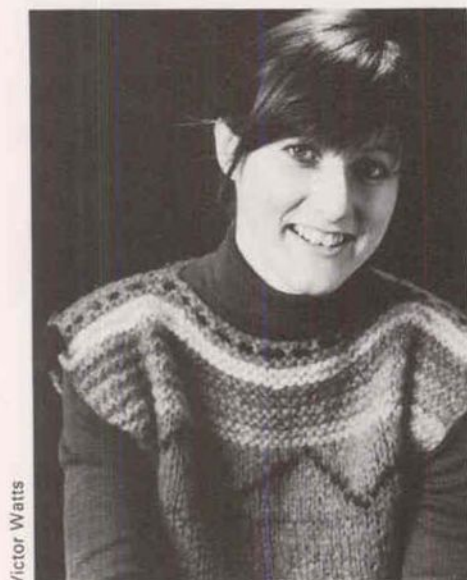
Exposure adjustments

Coloured filters work by absorbing some colours and stopping some light reaching the film. When they are in position over the lens, the exposure must be increased to compensate. Manufacturers publish a filter factor for each filter which indicates the exposure increase necessary. A $2\times$ filter requires twice the exposure, so you open up one stop or halve the shutter speed. If you prefer you can divide the ASA number

Landscape A red filter has been used to deepen a light blue sky. Note that the filter has also darkened the green trees and fields

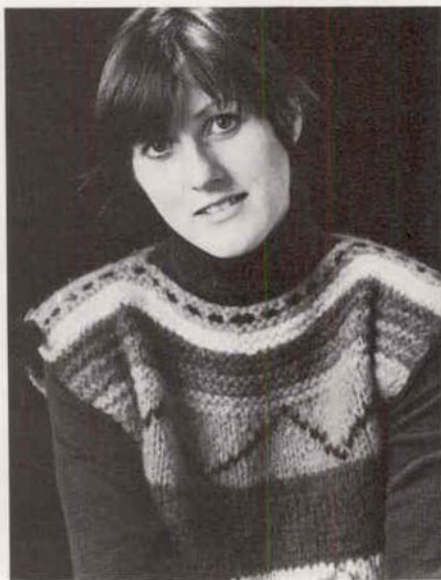
by the filter factor and reset the meter.

If you have an SLR camera with through the lens metering, the light meter will automatically compensate for the light of the filter, and if you can place the filter completely over the window of separate hand held meter, similar adjustment is made. Test your meter and filter first, however, because the colour responses of light meters vary and do not always correspond to that of panchromatic film. Test the filters in practical conditions with your own light meter until you find the best filter factor for each filter. Overexposure minimizes the effect of filters, so work accurately.

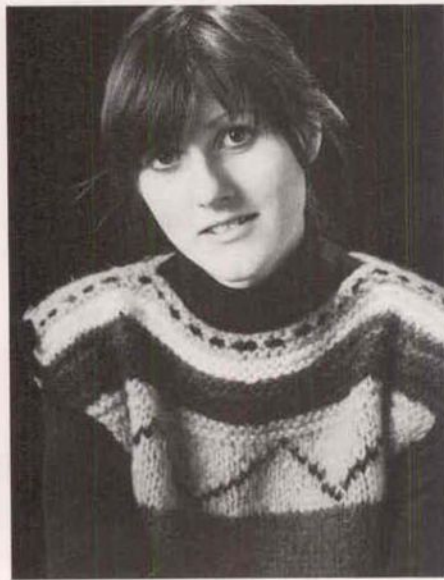


Victor Watts

No filter The standard rendering of skin tones and colours given by a conventional panchromatic film



Yellow filter This filter makes blues reproduce slightly darker, while slightly lightening skin tones



Orange filter A similar effect to that given by the yellow filter, but rather more pronounced

Girl in coloured jumper To show the effects of different coloured filters, we photographed a subject containing a range of colours and a light skin tone

Ultra-violet filters

Ultra-violet absorbing filters come in two strengths: ultra-violet, and skylight which has a weaker effect than a UV filter and has a slight pink tint. All ultra-violet radiation is scattered by haze so that distant objects are recorded on film in lower contrast than the eye perceives them.

This loss of clarity is restored by absorbing the UV radiation with a colourless UV or a skylight filter. Neither filter alters the exposure and both are often used as a way of protecting the front element of the lens. This has become such a common practice that many people forget the filter is in place and do not remove it when haze in the background would actually improve the photograph.

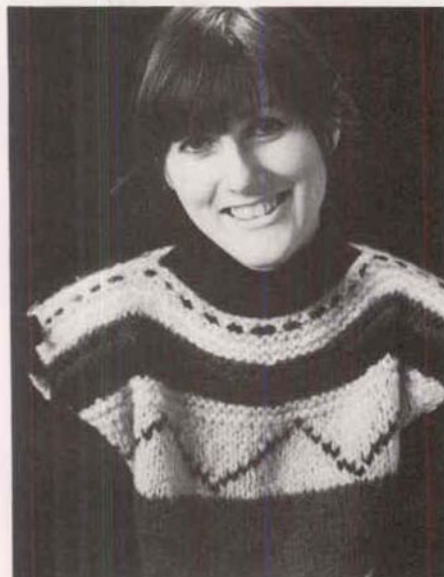
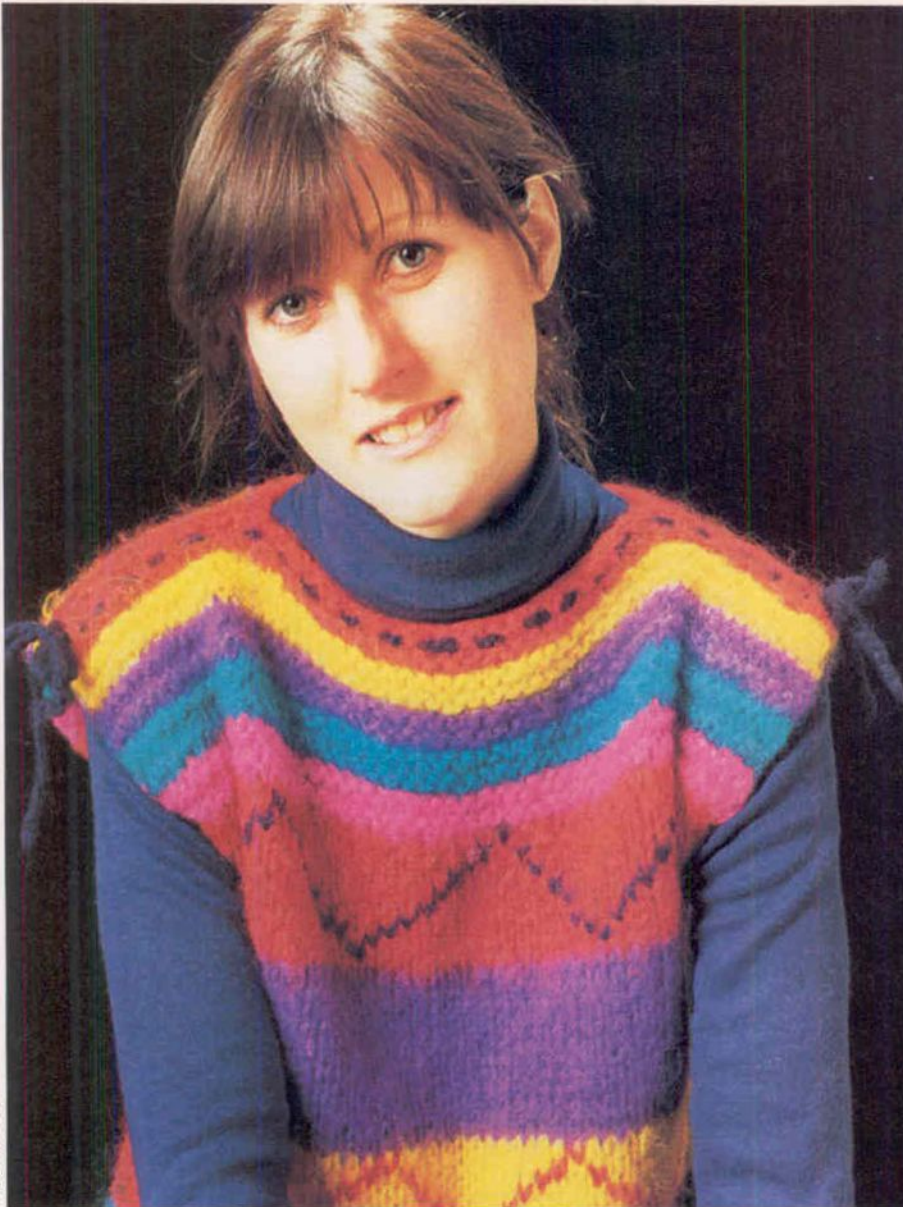
As yellow, orange, red, yellow-green and green filters all absorb ultra-violet radiation completely, there is no need to use a UV absorbing filter as well if you intend to eliminate the effects of haze. On the other hand, no harm results if a UV filter is inadvertently left in position when using other filters.

Neutral density filter

These filters absorb all wavelengths equally and appear grey in colour. They are used to control the exposure when for pictorial effect you want to use a large aperture and a slow shutter speed, while the best combination would overexpose the negative, and when it is inconvenient or impossible to change to a slower film.

Neutral density filters are available in different values and may be marked either with their filter factors, $\times 4$, for example, or with the density value, 0.6, for example. In the latter case, it is worth

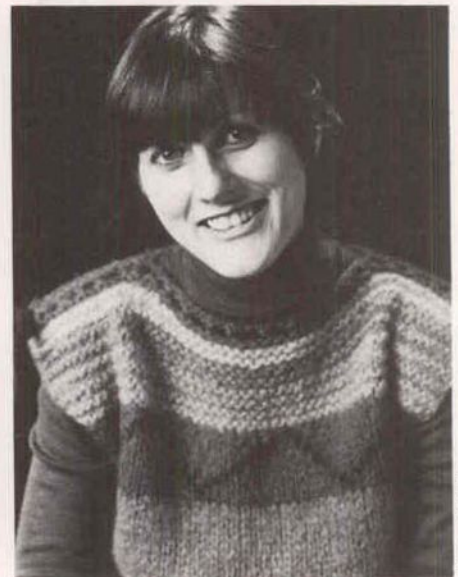
Victor Watts



Red filter Skin tones become flat and slightly pasty. Orange and red filters are useful for hiding skin blemishes



Green filter The stripes of the sweater are completely changed. Contrast of skin tones is slightly increased



Blue filter The stripes change yet again. Skin tone rendition has too much contrast to flatter the subject

Victor Watts

remembering that the exposure factor in terms of stops can be found by dividing the density value of the filter by 0.3. Dividing 0.6 by 0.3 gives the answer 2, and the factor is thus two stops or $\times 4$. Density values of combinations of filters are found simply by adding the individual densities together. The result is then divided by 0.3 to find the filter factor, in exactly the same way as for individual filters. It is worth making this slight extra effort to work out filter factors if you intend to use very deep neutral density filters to produce exposures that will last for more than a few seconds, since most light meters will not read through such dark filters. Even when you have established the proper filter factors for your neutral density filters, however, you will usually find when making long exposures that an extra allowance for reciprocity failure has to be made. This is the failure of film to behave as predicted by its ASA rating at very long or very short shutter speeds. If an exposure lasts more than a second, the lens aperture must be opened an extra stop wider than that indicated by a meter reading to compensate. A ten second exposure requires a two stop increase, and a 100 second exposure needs three stops.

A neutral density gelatin filter cut to fit over the reflector of your flashgun may occasionally be useful if the flash is too powerful or too near the subject.

Polarizing filters

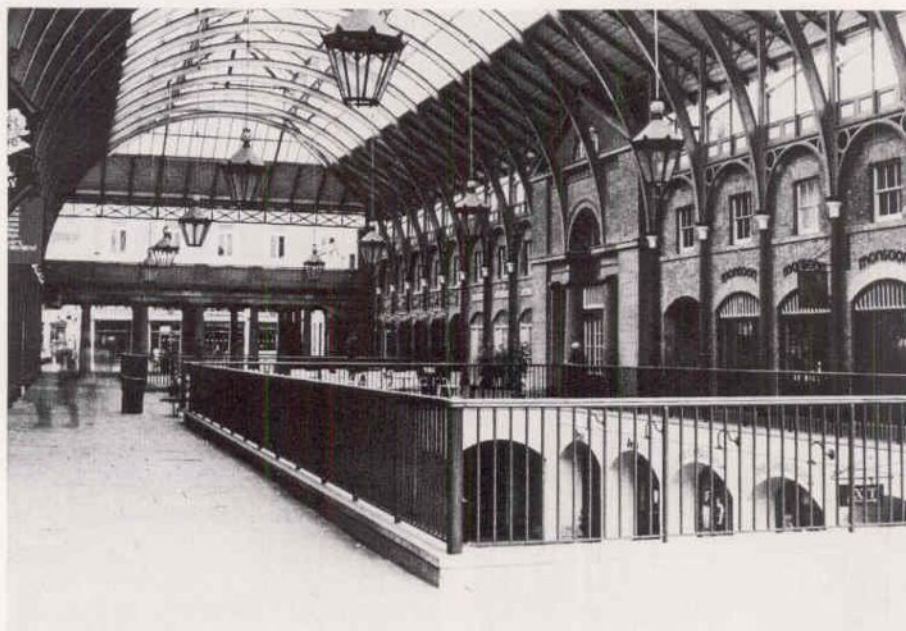
By using filters that transmit lightwaves vibrating in one plane only, at right angles to the light-direction, you can prevent unwanted reflections from many shiny surfaces (though not metal) from reaching the film. They also make blue sky at right angles to the sun somewhat darker without affecting the way other colours in the scene are reproduced by the film.

Polarizing filters are sold in mounts that allow the filter to be rotated when fitted to the camera lens. By rotating the filter you can control the effect that is given. With an SLR camera you can see what effect the filter is having by viewing the subject through the viewfinder with the filter in place. The amount of reflection reduction or sky darkening varies according to the angle of the filter and the angle of the light. With rangefinder cameras, view the subject through the filter, note the position giving the best results, and attach the filter to the camera in that position.

The factor of a polarizing filter is about $\times 3$ but for a particular make of filter the precise factor should be determined by experiment. It is not affected at all by the orientation of the filter on the lens. If you are using a hand-held meter, cover the meter's light sensor with the filter at the angle at which it will be used. With through the lens metering cameras the indicated exposure will usually be correct, but check your camera's instruction manual to make sure that the metering will work properly.



Covered market Taken with a large aperture 35 mm f/1.4 lens, shallow depth of field and pedestrians distract attention from the architecture of the building



Time exposure A tripod and a deep neutral density filter allowed a 12 minute exposure at f/22. Moving pedestrians have almost entirely disappeared

Filters in practice

Deciding which filters to carry with you in your gadget bag is a matter of working out which filters are going to be most useful for your type of photography. Filters that one photographer would hardly ever use may be an essential part of the visual style of another photographer. The most commonly useful filters that every photographer should have are probably UV filters, not so much for their negligible visual effect as for the protection they give to lenses. For general darkening of skies and an increase in contrast with black and white film, an orange filter is a handy compromise between the relatively mild effect given by a yellow filter and the

more vivid results given by red filters. And a polarizing filter can make all the difference to a photograph that would otherwise be spoiled by distracting reflections. Glass filters are the most common choice for the types used most frequently because they are more convenient for routine storage and use. Plastic filters require special mounts.

Always take good care of your filters. Replace them in their cases when they are not in use. Any optical defects in the filter will reduce image quality, and fingerprints, scratches and other imperfections will have as much effect as if they occurred on the lens itself. A lens hood should always be used to reduce flare when a filter is in place.

Victor Watts

Improve your technique

Bounce flash

Direct flash lighting from a camera-mounted gun frequently produces flat looking results. But bouncing flash lighting on to your subjects can produce attractively lit shots even from unpromising situations

Pictures taken with small flashguns mounted on the camera and aimed straight at the subject are rarely very pleasing. If the light in your pictures always comes from the same direction and has the same character—flat, but

with deep, hard edged shadows and pronounced fall-off over distance—then you need a different approach. Taking the flashgun off the camera's flash shoe is one answer (see page 226), but perhaps the most effective technique is to

point the flash unit at some reflecting surface, using the reflected light to illuminate the subject.

This technique, known as *bounce flash* because the light from the flash is bounced off the reflecting surface, can make your photos look much more interesting. It produces a light that is softer and more enveloping, which suits many subjects better than simple, direct flash on the camera.

Using walls and ceilings

Bounce flash from a white surface is as close to natural lighting as you can get with a portable flashgun. Obviously, any white surface reflects light, but a ceiling is usually the most convenient reflector.

Bounce from a ceiling *Pointing the reflector of a portable flashgun at the ceiling, midway between camera and subject, gives this pleasing result*

Direct flash *Mounting a flashgun—even one with a large flash tube—on your camera and pointing it straight at your subject gives a harsher effect*



The illumination then comes from above and shadows fall in the same way as by natural light. The light is scattered over a wide area and diffused by the matt texture of most ceilings, giving a soft, even illumination that still clearly comes from a single source.

The main disadvantage of bounce flash is that you are totally dependent on the location. Ceilings vary widely in height and colour. A ceiling that is dark toned or discoloured by tobacco smoke can absorb a great deal of light. With a high ceiling, the light from the gun has to travel further and may be too weak to properly illuminate the subject.

Many small flashguns are not powerful enough for most bounce work, even though they may be fitted with tilting flash heads. Relying exclusively on bounce flash for lighting interiors other than normal domestic rooms can lead to problems with exposure, though the flash can be used as a fill-in to supplement the existing lighting.



Poor aim If your bounce angle is too steep, the result can be uneven illumination of the subject

Manual bounce

When using bounce flash with a manual flashgun in a room or studio, you need to increase exposure to allow for the light absorbed by the ceiling or wall and the distance from flash to ceiling to subject. The table below gives the increase in exposure necessary for a range of subject distances in a typical domestic room. If the ceiling is much higher than 2.5 m, exposure must be increased accordingly.

Distance from flash to subject	Extra f/stops
1 m	3 stops
1.5	2
2	1½
2.5	1½
3	1½
3.5	1½
4	1½
4.5	1½
5 and over	1



Some automatic flashguns have an exposure confirmation light that blinks if enough light has reached the subject for correct exposure. These can be a useful reassurance. If you have an automatic flashgun, this takes care of the exposure under most circumstances.

If your gun only offers a limited range of aperture settings for use on automatic and none of these is suitable for the distance you are working at or the reflectivity of the ceiling, you may need to switch to manual. Calculate the proper lens aperture yourself, and add the distance the light travels from the flashgun to the ceiling to the distance from the ceiling to the subject. Make an extra allowance for the light absorption of the ceiling. A plain white ceiling normally requires at least an extra stop exposure, but this may vary considerably from room to room.

You can make reliable estimates of the necessary correction with experience. Until you have gained this experience, bracket your exposures: make extra shots at one stop more and one stop less than your calculated aperture setting. When working out the correct exposure for manual bounce flash, it is safer to assume that the ceiling is slightly higher and slightly less reflective than it looks.

Bounce flash can create pictorial problems too. If the angle of bounce is too acute, your subject may suffer from heavy vertical shadows. Strong shadows under the eyes and chin can spoil a portrait and are as unsightly as direct flash on camera. Shadows like this are inevitable if you attempt to bounce the



Bounce from a wall The even sidelight given by bouncing your flash off a wall can often resemble natural daylight from a side window

Coloured bounce Beware of coloured walls, especially cool blues and greens. The results will have a cast which may not be what you wanted



No reflector Side bounce from a short distance can give deep shadows with insufficient detail



Silver reflector A sheet of silver foil held on the shadow side of the subject improves the lighting ratio



Gold reflector A more pleasing effect is given to skin tones by using gold-coloured foil rather than silver



Reflector distance The amount of shadow fill can be varied by altering the distance from reflector to subject

flash virtually straight up and down. One answer to the problem is to use a more powerful flashgun and stand further back from your subject, but a better solution may be to bounce the light off a wall rather than a ceiling. In this case, light strikes your subject from the side, giving a similar form of illumination to that from a large window. If you are using colour film, beware of coloured walls. Any light reflected from a coloured wall gives a cast to the subject you are photographing. This is not much of a problem if the wall is pale pink or buff, but green or blue walls can give unpleasant skin tones.

Reflectors

The next logical step after bouncing light off a wall is to use a reflector to direct light into shadow areas. A white sheet pinned or taped to a wall makes a simple and reliable reflector. Sometimes you may want a brighter reflection than a white surface can give. In this case, you need a silvered surface. There are sophisticated reflector sheets, coated silver on one side and white on the other, that fold up small enough to fit into a camera bag. An inexpensive alternative is to stick aluminium foil on to a sheet of expanded polystyrene of the sort sold by builders for home insulation.

Unfortunately, there are few occasions when the subject can easily be placed by a wall, and a wall mounted reflector is not very versatile. At home you can make a mobile reflector by draping a sheet, or a large piece of paper, over a clothes-horse or any suitable piece of furniture. When setting it up, angle it so that light is reflected into the areas that you wish to illuminate. This can be difficult if the flashgun is mounted on the camera, but with an extension cord you can move the flashgun around until you achieve the best illumination.

Outside the home, providing reflectors can be a problem. There are

Victor Watts



Bounce boards These attachments can provide soft frontal light at close distances, and are easily portable

Soft lighting The effect given by bounce board flash attachments is particularly suitable for close portraits

rarely any suitable walls, and it can be awkward carrying your own reflector everywhere. Even if you do persevere and carry a reflector to the location, it can be difficult setting it up. The best solution is to ask a friend to hold your reflector, but if this is not practical you can often get by with sticky tape and spring clips. Bear in mind that reflectors have to be large and conspicuous if they

are to be effective. They need to be used quite close to the subject, so it is not really possible to take unposed candid photographs with reflectors.

Bounce boards

Some manufacturers have sought to overcome some of the problems of using bounce flash by making brackets that clip on to their flashguns. These

brackets hold a piece of white board that is angled towards the subject to provide a directional form of bounce lighting.

When used properly, these devices can be very effective. The distance from the flash to the bounce surface is constant, and so is the reflectivity of the board. This simplifies exposure calculations considerably if you decide to set your flash manually.

Problems arise when you try to use these reflectors at too great a distance from your subject. Light from the flashgun illuminates the reflector board so that the subject is in effect lit by the large board rather than by a small flash tube.

If you stand close to your subject so that the width of the board relative to the distance from the subject is large, then the light will fall on the subject evenly from many different angles. The effect will be to give a soft frontal lighting if the flash and reflector board are mounted on the camera. But if you move too far back, so that the ratio of board size to distance is smaller, then the effect will gradually become almost indistinguishable from ordinary direct flash.

Bounce boards also tend to be bulky and may not mount very securely on your camera. These drawbacks reduce the usefulness of bounce board attachments for photography outside the home or other more controlled situations. They are most useful for highly mobile subjects such as young children and pets, when you wish to avoid the contrast and hard shadows of direct flash. Their effect is also particularly useful for head-and-shoulder portraits.

Portable bounce Fitting a flashgun with bounce board attachment to your camera can make your equipment top-heavy, but the results should more than compensate



Twin tube flashguns

Another attempt by flashgun manufacturers to solve the problems created by direct flash on camera is the twin tube design. Bounce flash from a ceiling usually requires a powerful flashgun so that you can stand sufficiently far from your subject to reduce unpleasantly hard vertical shadows. Twin tube flashguns use a small second flash tube pointing directly at the subject to fill in these shadows and allow you to work close to your subject while still keeping some of the advantages of bounce light. Since you do not need to be so far away, the flashgun itself can be smaller, cheaper, and easier to carry.

A certain amount of thought is needed to use these units effectively. Because they produce results under a wide variety of conditions, it is easy to forget that the main light is supposed to be provided by the bounce tube pointed at the ceiling. If the ceiling is too dark or too far away, the subject will be lit entirely by the direct light of the secondary flash tube and you will be back where you started—using direct flash on camera. In such cases, it is best to accept the inevitable and point the main flash tube at the subject to use the full power of the gun.

Twin tube flashguns provide more attractive lighting than ordinary direct flash units, but the effect they give can become just as routine as direct flash if used too often. Try to vary the way you use these units as much as you can. Remember also that the proportion of

bounce to direct flash on which the manufacturer has preset the unit may not suit your pictures. If this is the case, you can make adjustments by taping pieces of opaque card or paper over the flash tubes until the effect is just right to suit your style.

Twin tube flash A compact compromise between direct and bounce flash, above. The results, below, show agreeably soft, indirect light combined with the greater liveliness of direct flash on the camera. The direct flash helps to fill in the shadows





World of photography

Electron micrograph

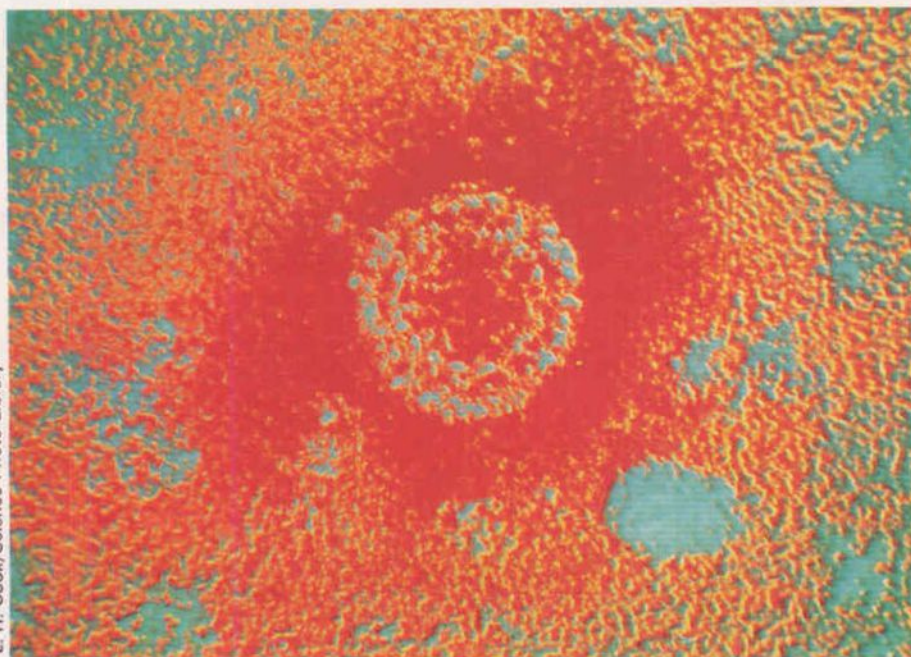
This extraordinary technique can reveal the astonishing hidden world that exists all around us in greater detail than ever before

or deformities in materials which have failed. For instance, study of the debris from an airplane may show whether it crashed because of metal fatigue or a faulty weld.

There is hardly a single physical science, from medicine to botany, from materials science to zoology, in which the electron microscope has not become an indispensable tool, opening up whole new areas for research and photography. The reason is simple. Ordinary, optical instruments—the kind in every school laboratory—magnify only a few hundred times. Even highly specialized optical microscopes can magnify up to only about 2500 times. But the most advanced electron microscopes magnify over five million times, and can resolve even individual atoms.

What limits the optical microscope is the wavelength of light itself. This is about half a micron (two millionths of a metre or 1/50,000 of an inch). Trying to use light to see something smaller than the wavelength of light would be like trying to paint a pencil-thin line with an emulsion brush. What is needed to achieve greater magnifications is a form of radiation which has an altogether shorter wavelength. In the early years of this century scientists hoped to use X rays for this purpose, but they could not then find any means of focusing them (X ray microscopes are being developed at the moment). The discovery that electrons are not just particles, but also behave like waves, and that they can be deflected and focused electromagnetically led to the first prototype electron microscope in 1932, built by the German scientist Max Knoll and Ernst Ruska. In 1939 the first commercial machines came on to the market.

These were transmission electron microscopes and they worked very like their optical counterparts. In an optical microscope, a beam of light is focused by glass lenses to pass through a thin specimen. The beam is then refocused and enlarged by two lenses—the objective lens and the projector lens—to form the final magnified image. In the TEM a beam of high energy electrons, produced by heating a filament of



E. H. Cook/Science Photo Library

With an electron microscope it is possible to photograph anything from the tiny hairs on an insect's eye to individual atoms. Objects too small to be seen by even the most powerful optical microscope can be seen large and clear. Scanning Electron Microscopes (SEM) and their sister instruments, transmission electron microscopes (TEM), have not yet achieved the popularity of giant telescopes that peer into the far reaches of the universe, but the images they produce are every bit as spectacular and their discoveries have a much more immediate and practical use.

One of their most important achievements to date has been photographing minute individual viruses. Though the existence of these organisms has long been known, no one before electron microscopists had actually seen them. By studying their structure, scientists have been able to identify the agents that cause diseases like hepatitis, flu, yellow fever and polio.

In a quite different field, SEMs play an important role in the rapid species identification of crop pests, enabling the correct pesticide to be used. SEMs are also used to examine microscopic cracks

Hepatitis-B virus Magnified by about a million times, this TEM of a virus has been artificially coloured by a technique called posterization

At the controls The operator of this SEM views the image on a screen, while the photograph is taken using the camera back on the top left side of the machine



Ray Marlow/Science Photo Library



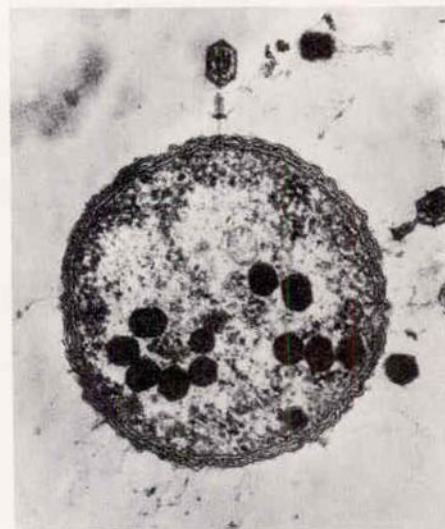
Braula fly This SEM of a fly crawling over a honey bee has a magnification of 160. The fly is tinted by hand to resemble its true colour

Viral attack The large bacterium in this TEM is an *E.coli* cell which is being 'hijacked' by the hexagonal shaped bacteriophage viruses

tungsten, is focused by magnetic instead of glass lenses to pass through the specimen. It is then refocused and magnified by magnetic objective and projector lenses to form the magnified image on a fluorescent screen or directly on to a photographic film or plate.

The very different principle of the scanning electron microscope though described by Max Knoll back in 1935, was not developed until the late 1940s, mainly by C. W. Oatley of Cambridge University, and it was not until the 1960s that it became commercially available.

The two types of electron microscope perform different functions and produce quite distinct types of pictures. The TEM, because it looks at extremely thin sections of matter, is useful for viewing the interior of objects—the cross-section of a bacterium for instance, or a tiny slice of lung tissue. Results are necessarily two-dimensional in appearance; there is no sense of the three-dimensional object from which the slice is taken. This is where the SEM comes in. Instead of shining electrons through a specimen it effectively bounces them off its surface. The specimen therefore does not need to be a thin section at all; it can be whole and even quite large. Because the SEM views the surface of an object, and because it has an astonishing depth of field, it displays a bacterium or a piece of lung tissue as we would see them if we could shrink ourselves down to their size. In other words, by restoring three dimensions to our view of the micro-world, it has given it reality. On the other



hand, the SEM cannot achieve the very high resolution of the TEM.

Electron microscopes have two important limitations. The first is that they cannot produce pictures in colour—though various techniques are occasionally used to colour originally black and white micrographs artificially. The reason, of course, is that colour is a property of light. Indeed, in the extreme micro-world, when dealing with objects that are themselves smaller than the wavelength of light, colour is a meaningless concept—it does not exist.

The second limitation is that electrons do not travel any distance through air, so the specimen has to be sealed into a high

vacuum. This matters little in the case of the TEM, since it deals mainly with pieces of material. But in the case of the SEM, which can accept whole organisms, it makes it extremely difficult, though not impossible, to view live specimens.

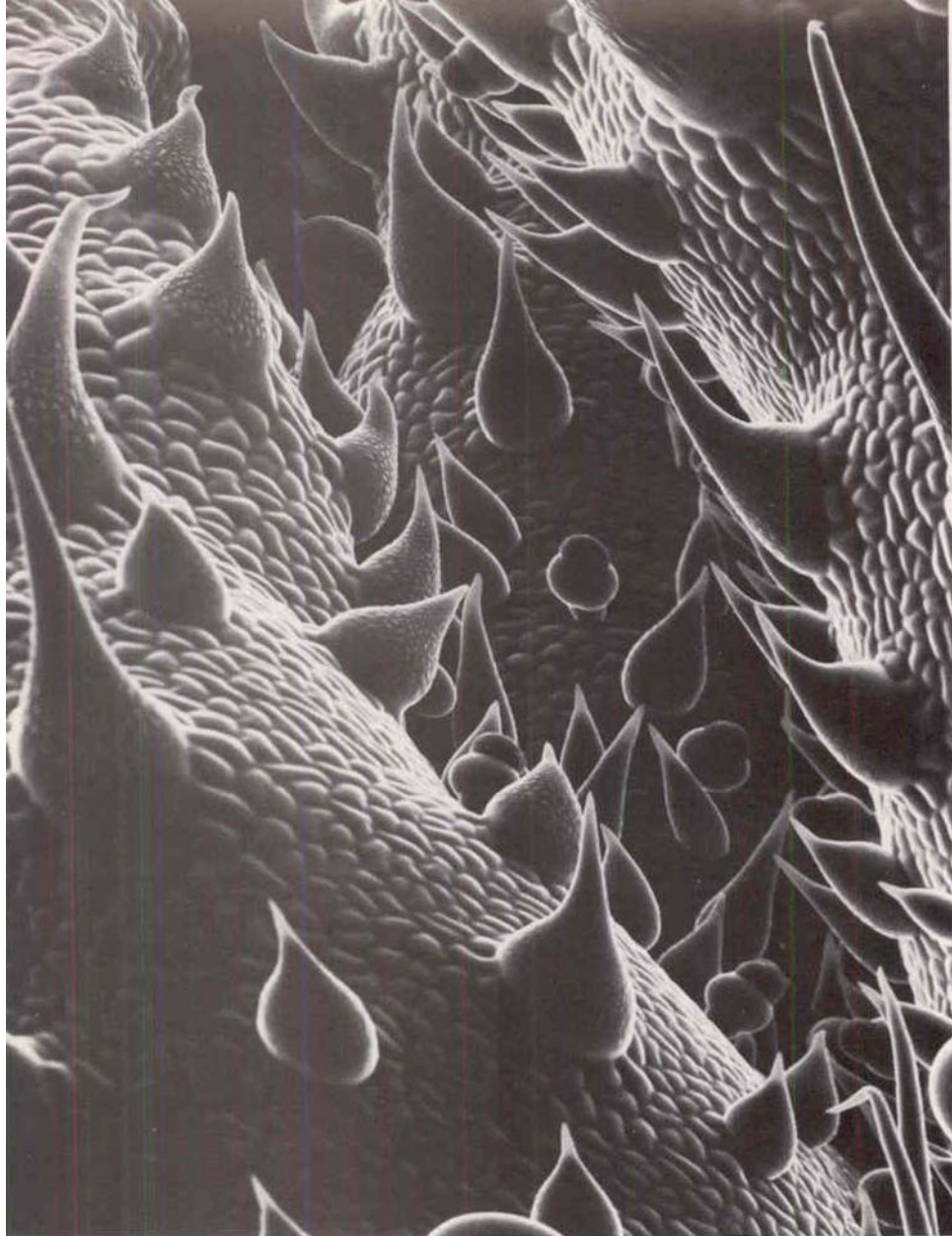
The SEM works by using a much more finely focused electron beam than the TEM. The beam is scanned to and fro across the specimen in a zigzag pattern—the same pattern in which an electron is swept across the screen of an ordinary television set to build up a picture.

When the beam strikes the SEM specimen it causes other electrons to be knocked out of their orbits around the atoms on the specimen's surface. These 'secondary electrons' are attracted to a positively charged detector. The recorded signal is processed and amplified in various ways before forming an image on a cathode-ray tube, like the one in a television set.

Most SEMs, in fact, have two cathode-ray tubes. One is the small television-type monitor which the operator uses to view the specimen as he manipulates the various controls to find the desired angle and degree of magnification. The other, which is hidden behind the SEM's built in camera, is the high resolution screen used for the actual photography.

Preparing for SEM pictures

Obtaining high-quality electron micrographs requires careful preparation of the specimen. With the SEM, the amount of detail obtained depends to a large extent on the number of secondary electrons emitted from the specimen's surface. For this reason, non-metallic specimens are usually coated with a layer of some conductive element, most commonly platinum, gold, or gold-



Cannabis sativa David Scharf magnified a marijuana leaf 500 times with his scanning electron microscope to produce this fantastic image

following: drying (air drying, freeze drying, critical point drying or dehydration), freezing, chemical etching and chemical fixing. Thus prepared, the specimen is mounted and coated, (gold or platinum coated insects, such as the mosquito, look like exquisite miniature jewels.)

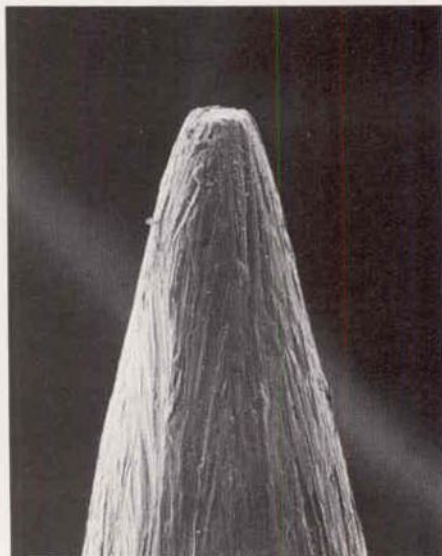
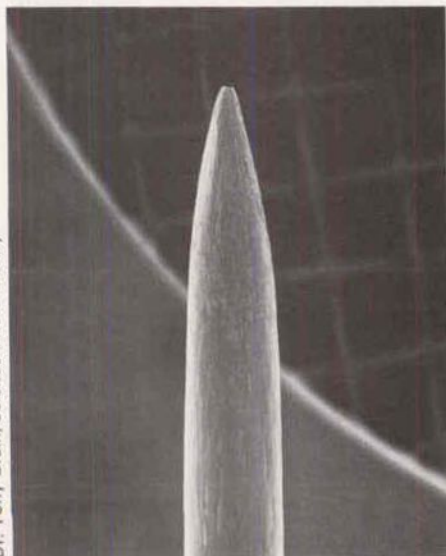
One of the few professional non-scientist micrographers, American David Scharf, does not subject his specimens to any of this complex preparation. The 'traumas' which result in such common problems as a leaf surface which is unnaturally shrivelled by too hasty drying or an insect with legs or antennae that have broken off during rough handling are thus avoided. Scharf can also view live specimens and even, in the case of the hardier micro-organisms, remove them from the vacuum still alive. While producing pictures of outstanding quality, Scharf's methods have two insurmountable drawbacks for scientists. Work has to be extremely rapid, because the high-energy electron beam heats the specimen, damaging it after a few minutes and causing any moisture left in the subject to turn to gas, which can spoil the picture. Secondly, for the same reasons, the specimen cannot be preserved for viewing again in the future.

The basic principles employed in taking pictures with the SEM are those of good copy photography, since what is being recorded is an image on a cathode-ray tube's screen. However, whereas the SEM's viewing monitor—like an ordinary television—shows the whole picture at once, the high resolution cathode-ray tube used builds the picture up in slow-motion, dot by dot, with each line dying away as the next one appears. Exposure usually lasts two to three minutes, with each part of the film frame being exposed consecutively instead of simultaneously. The slower the scan, the greater the definition.

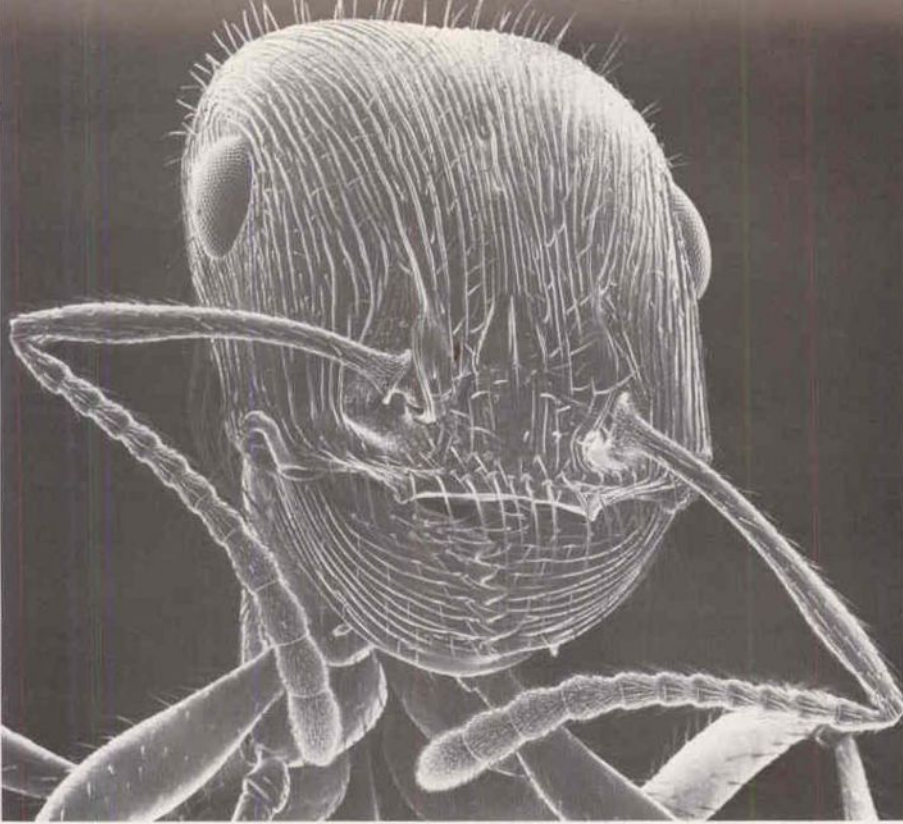
David Scharf/Oxford Scientific films

palladium. The coating, which increases secondary electron emission, is only about 100 to 150 atoms thick and is applied by evaporating or sputtering the metal being used, to form a uniform layer over the specimen surface.

Inorganic specimens only need to be coated and mounted on a metallic stub before being sealed into the SEM. Biological specimens, however, require more complicated preparation. This usually involves one or more of the



David Scharf/Oxford Scientific Films



Harvester ant *The body of this red ant is actually only about 12 mm long, but on this SEM its monstrous head has been magnified over 50 times*

While most ordinary television pictures are built up in 625 lines, the SEM employs 1500 to 2500 lines. If less were used, the lines would be visible in the resulting picture, as anyone who has taken a photograph from an ordinary television screen will know.

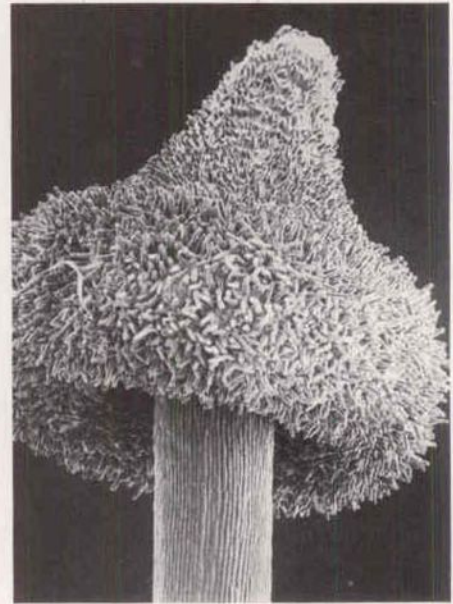
The cameras used for SEM photography are usually ordinary commercially available equipment, though some SEM manufacturers provide custom-altered standard cameras or custom-made cameras with standard lens and back. They range from 35 mm to 4 × 5 inch format and are usually built into the instrument. The film used is also one of the standard commercial products. Ilford FP4 and Kodak Plus-X are popular and

Polaroid sheet film is often used for instant results where an SEM is being used for industrial quality control or scientific identification work.

The SEM has a large number of controls which allow the operator to vary considerably the way in which he actually records a picture. As well as the ability to tilt and rotate the specimen, and to vary magnification from as low as five times to tens of hundreds of thousands of times, he can alter the brightness and contrast electronically and choose the speed at which the picture is scanned. One general rule is that the higher the magnification, the longer the scan time needed for good resolution. Another rule is that the higher the voltage of the electron beam, the greater the contrast.

A number of problems are unique to SEM photography. Perhaps the most crucial is the difficulty of focusing the

Polyanthus stigma *When magnified to this size, even the tiniest parts of plants assume an individual beauty. This SEM is magnified 40 times*



Long Ashton Research Station/Science Photo Library

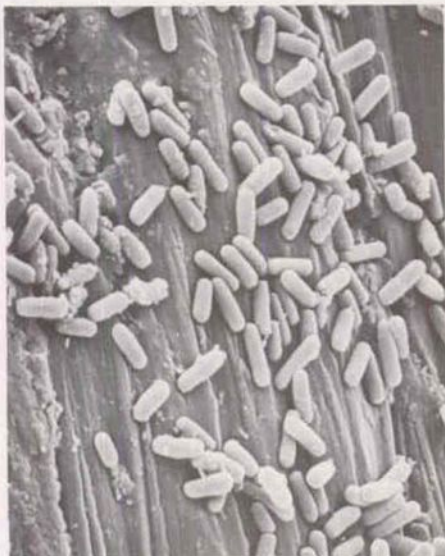
camera on the cathode-ray tube screen. The built in cameras in SEMs do not have a viewfinder through which to focus. Even if they did, it would be difficult to focus an image that is seen only a line at a time. As a result, a number of aids are often used for focusing the camera. Micrographers, therefore, generally use a medium *f*/number—usually *f*/8—to achieve the maximum depth of field in their pictures.

Another problem is *charging*, where one, or more, of the lines that make up the picture carries more energy than the others and comes out anomalously bright. One cause of this is poor coating of the specimen. The electron beam is absorbed by the uncoated part and a charge accumulates until suddenly discharged in a flurry of secondary electrons. A similar result occurs when any moisture in a specimen is heated by the electron beam and suddenly 'out-gases'.

Preparing for TEM pictures

With the transmission electron microscope both specimen preparation and photographic technique are quite different. Biological specimens are first dehydrated and chemically fixed, and set into an epoxy type resin, which solidifies the tissue. They are then placed in an instrument called an *ultramicrotome* in which is an extremely sharp diamond or glass knife. This cuts off slices so thin

Pin point *Enlarging a pin head by 15, 75, 375, 1875 and 9375 times progressively reveals rod-shaped bacteria, and shows the zoom effect of the SEM. At magnifications of over 500 the SEM gives more detailed results than an optical microscope because the wavelength of the electrons being used is much shorter than that of light*





Bristled amoeba *These euclypha ciliata amoeba exist in vast numbers in soil and moss. This tinted SEM has been magnified over 4000 times*

that the thickness of this magazine's paper would produce 1000 to 2000 such slices. The slices fall from the knife on to water where they float and can easily be picked up on the small copper or gold grids which act as specimen carriers. Other specimens, such as powders and metals, are prepared using different techniques.

The prepared section is then placed straight into the microscope, but biological ones are usually floated on a heavy metal salt solution—uranium acetate or lead citrate—which selectively binds to specific areas in the tissue. The contrast in a TEM picture depends on how many electrons get through each part of the specimen, as opposed to being absorbed or reflected. The heavy metals' salts stop electrons and therefore make the parts of the tissue to which they bind stand out.

In most TEMs the picture is formed by the electrons which are generated from the heated tungsten filament and transmitted through the specimen, striking the photographic emulsion directly. The system is not really photography at all, since it is not photons of light that strike the film. Each high energy electron reaching the film may cause numerous silver halide grains to become developable—whereas many photons of light are needed to develop one grain—special film emulsions are used to record transmission micrographs. Because no lens or camera is involved, the film—ranging from 35 mm to 4 × 5 inch in size—is simply held flat in a metal cassette. Exposure times are usually of the order of one to eight seconds.

In addition to the basic transmission and scanning electron microscopes, there are several specialist instruments which permit a variety of other methods of investigation. For instance, bombardment of the specimen with high

The source of life *A vital element in genetic engineering, this tiny loop of DNA is shown in this TEM with a magnification of nearly 200,000*



Dr. Stanley Cohen/Science Photo Library

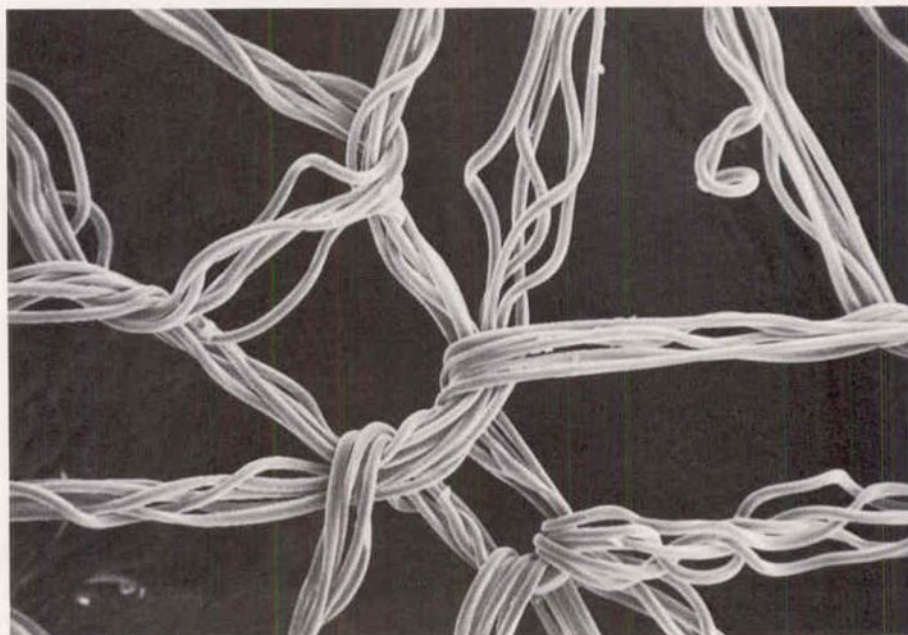
energy electrons causes it to emit X rays which can be recorded to give extremely accurate analysis of the specimen's chemical composition. Hybrid instruments enable the operator both to look through the specimen (in a transmission mode) and at its surface (when scanning).

Most TEMs use electron acceleration voltages of 50,000 to 100,000 volts, but very large instruments have been built with accelerating voltages of 500,000 to three million volts. It is these machines that can produce images of individual atoms and their components.

Such instruments are likely always to remain the province of scientific researchers, but the same is not true of the standard electron microscopes, and especially the SEM. Just as the optical microscope has come to be used by millions of amateurs around the world to observe and photograph chemical crystals or tiny organisms, the SEM could well become a hobby for people who are relatively wealthy, technically minded and endlessly inquisitive. There is a fascination about this new three dimensional view of the microworld that can easily become compulsive—everything you put in it, from a piece of tissue to a household bug, reveals an extraordinary new reality where giant monsters inhabit vast surreal landscapes.

A really good research-quality SEM nowadays costs as much as a Rolls Royce but there are portable bench-top scanners on the market for a fraction of this price, which could fall considerably in time. David Scharf is only one of several professional non-scientist micrographers who have emerged in the last few years. There is even said to be someone in north London who bought an SEM just to enable him to produce paintings of the microworld as he sees it on the screen!

Twisting threads *This bizarre SEM is, in fact, a section of a pair of nylon tights. Even the most mundane objects are unrecognizable when magnified*



Dr. Tony Brain/Science Photo Library



Creative approach

Children

Taking good photographs of children may sound easy but without the right approach you can end up with disappointing results. However, once you master the basics you will find them very satisfying subjects

Trying to capture children on film can be one of the most rewarding of all photographic activities, but it can also be frustrating and exasperating. Persuading a lively child to sit still and pose properly is virtually impossible. Even if you succeed, the chances are that the result will be disappointing. Nearly all the best photographs of children are candid and

informal, capturing fleeting smiles or tears, a moment funny or touching, memorable or endearing.

Whether you want to photograph your own or someone else's children, one of the best approaches is to have a long informal session with the child, taking pictures as they present themselves. Be patient and let the child get used to the

camera and always be prepared to waste a little film. But above all make sure the child is occupied and happy—a bored child is rarely photogenic.

Find a location where there is plenty of light available—with the unpredictable behaviour of a young child, you need a fast shutter speed and narrow apertures to keep the picture sharp—and set up or wait for situations in which you know the child responds. Your choice depends very much on the individual child. You could give toddlers their favourite toys in the highest room in the house or photograph them outdoors: in the garden, by the sandpit or splashing in the paddling pool. With older children, outdoor locations with plenty of scope for boisterous games may provide the best results. Anywhere they can run about freely will do.

There is no need to dress children up in their best clothes or scrub their faces. Clean children are rarely any more photogenic and are probably so uncomfortable that it is impossible to get anything more appealing than a forced smile. Even if they look less angelic, children are usually more photogenic when running about freely in their everyday clothes—grubby knees, socks falling down and all.

The best opportunities for photographing children occur when they are at their most expressive or at ease: climbing trees, in the playground or on the football pitch, or when they are experiencing something new. The first time they see snow, for instance, or a first encounter with small farm animals can provoke some fascinating reactions.

Record their moments of frustration, irritation and tears as well as moments caught unawares around the house, reading by the fire or staring moodily



John Benton-Harris



Julian Calder

Burnt out wreck To photograph children in their element you have to look for good locations, like this derelict site

Smile please To get an unusual shot, give the child something to play with and then wait for the right moment



If you do not have children of your own or wish to extend your range of opportunities for photographing them, look for good locations where children will congregate. Playgrounds, parks, streets, housing estates and derelict sites are all common places for children to gather. Cameras can provoke a good deal of hampering curiosity so some photographers prefer to shoot from a distance with a long lens. But if children do spot you taking pictures secretly it may well ruin your chances of achieving any kind of rapport with them, or of obtaining any decent pictures. One way to avoid this is to let them see you with your camera, answer their questions and explain that you want to take pictures of them playing naturally. There may be some laughter and derision, but with a little persuasion, they will probably oblige. Children are less bothered about their image than adults, and once they have overcome the novelty of being photographed they will return to their games, leaving you free to take pictures. The advantage of this approach is that children have a natural tendency to put on a performance anyway. Once they know you might be photographing them, their actions, gestures and expressions may be slightly more exaggerated and enhanced.

Remember when taking this sort of shot, however, that some people may disapprove of your activities, particularly if young children are involved. It is probably advisable to approach them

Playing with fire Children often seem to be more at ease when they are outdoors, so the garden is a good location

Out in the street At the sight of cameras children usually put on a performance so all their gestures become exaggerated

out of the window. Make the most of their natural desire to show and express their feelings and be ready to capture those moments on film.

Photographing children well is less about technical knowhow and careful planning than the ability to recognize a potential picture and press the shutter at just the right moment. Planning your session rigidly can even be a disadvantage. It is easy to become so frustrated when planned shots fail to appear in the viewfinder or to become so engrossed in obtaining one particular shot that you miss all the fresh new moments that happen in the meanwhile.

Look for moments that are slightly unusual and do not always opt for the obvious shots. A birthday party is a good theme, but there are many delightful moments besides traditional highlights such as blowing out the candles. A shot of smaller children trying to cope with a large slice of sticky cake, or a crying child in a temper, might be far more memorable. The secret is to wait and be patient. Children often look their best as soon as the camera is put down, so keep it to hand for as long as you have film.



through another adult familiar to them.

Both early morning and later afternoon are probably the best times to photograph children. Out of doors the sun is low, giving form and modelling to the subject as well as warmer tones. Back-lighting helps to soften the outline and rings the head with light, giving a dreamy, glowing quality that can make a mischievous child look innocent.

Choice of background is an important aspect of child photography. Unless it is particularly relevant to the picture keep it simple or throw it completely out of focus by using a large aperture.

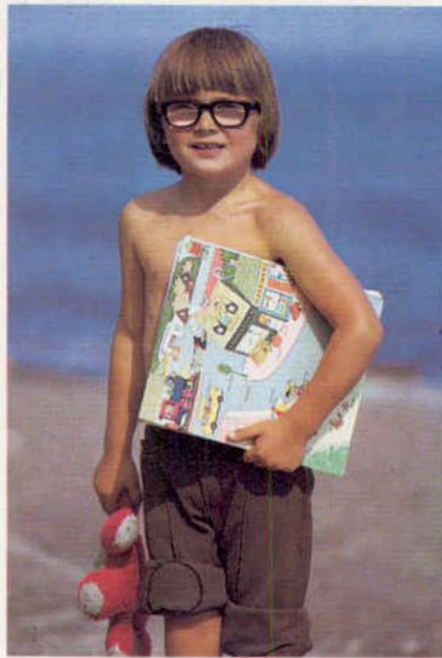
If you are photographing children on the move, you can suggest movement in your pictures by careful choice of shutter speed. Simply select a speed which is too slow to freeze the action, or choose to blur the background slightly by panning the camera with the moving child, at a speed of around 1/30 second.

Experiment with viewpoint too. Try shooting some of the pictures from a kneeling position—the child's eye view. Shooting from this lower angle produces pictures which give the child a very dynamic quality.

Formal portraits

Although they often look forced and unnatural, formal portraits of children can be attractive and appealing.

The setting should detract as little



On the beach Viewpoint is important in child photography and this shot benefits from being taken at the child's level

Mud pie One of the biggest challenges is to take photographs which offer a glimpse into the private world of children

as possible from the child's face. Avoid patterns and stick to plain, bright clothes and an uncluttered background.

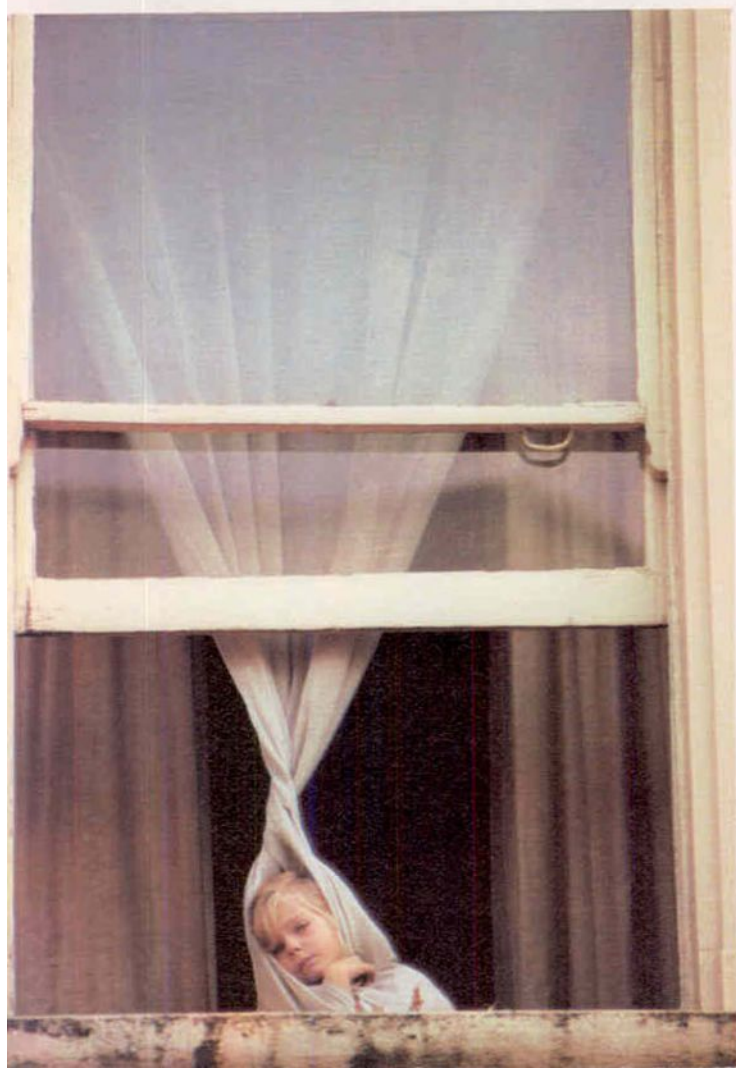
In a portrait, it is as important to emphasize character as physical details, so try to evoke a response from your sitter that typifies their character. It might be the appealing sidelong look they give when they want something special, or the way they throw back their head when giggling—so find out something about your subject beforehand.

When working with children in this kind of situation, be polite, firm and precise in your direction and they will respond as well as most adults. Their span of concentration is shorter, however, so be well prepared to work fast. To avoid wasting time, take all meter readings before the child comes on the scene by recruiting an adult as 'stand in'. Have the camera set and loaded, and have more film ready. If your child simply does not want to cooperate it is best to leave the session to another day.

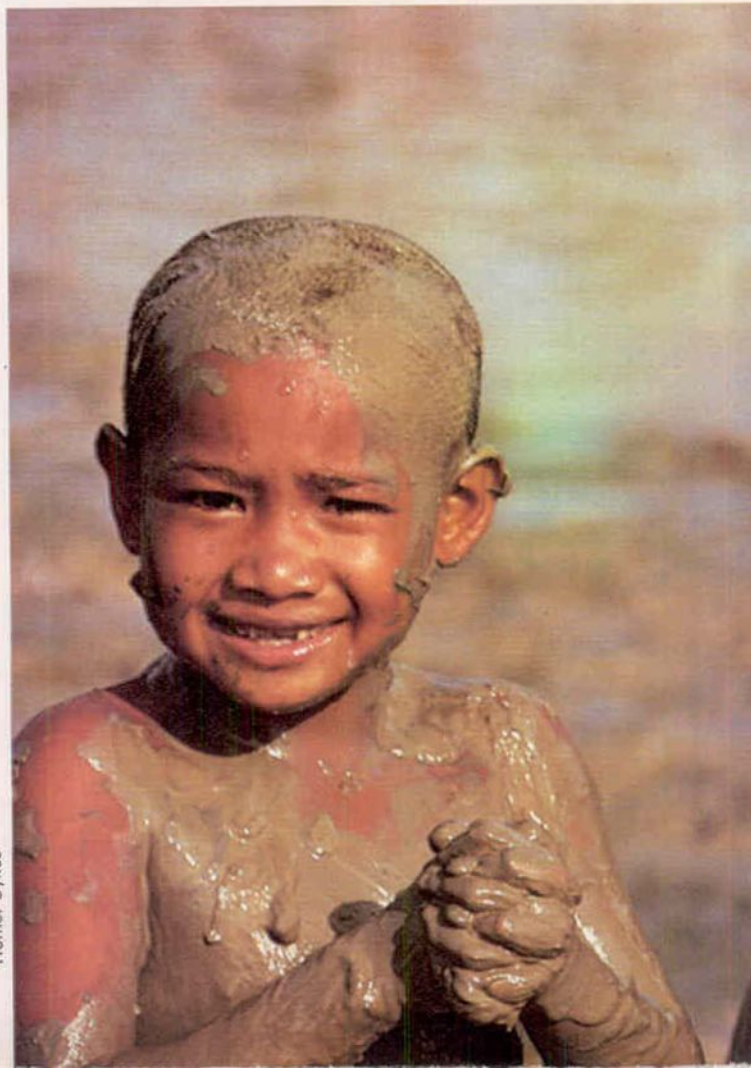
To take attractive natural pictures of children, you do not need a lot of expensive equipment or ideal weather conditions. Imagination and a couple of lively children who are not afraid to show their feelings and natural emotions in front of the camera are the best ingredients. Most of all, you need to be able to recognize a good moment to press the shutter—and a lot of energy.



Victor Watts



Homer Sykes





Homer Sykes

Vautier/De Nanxe



Combination printing

Combining two or more separate negatives can both enhance straightforward photographs and create completely new pictures which would not be possible by other means

Prints are normally produced from a single negative, but by printing two or more negatives on to the same sheet of paper you can add that extra detail that makes a good picture great. You can even create entirely new pictures in your own darkroom. Skilful combination printing opens up an entirely new world of creative possibilities.

Negative sandwiches

One of the simplest ways of making combination prints is to sandwich together a pair of negatives (any more makes printing difficult). You must choose your negative pair carefully. Match them for graininess, image contrast and other characteristics; other-

wise, it can be difficult to assess printing times and the correct paper grades.

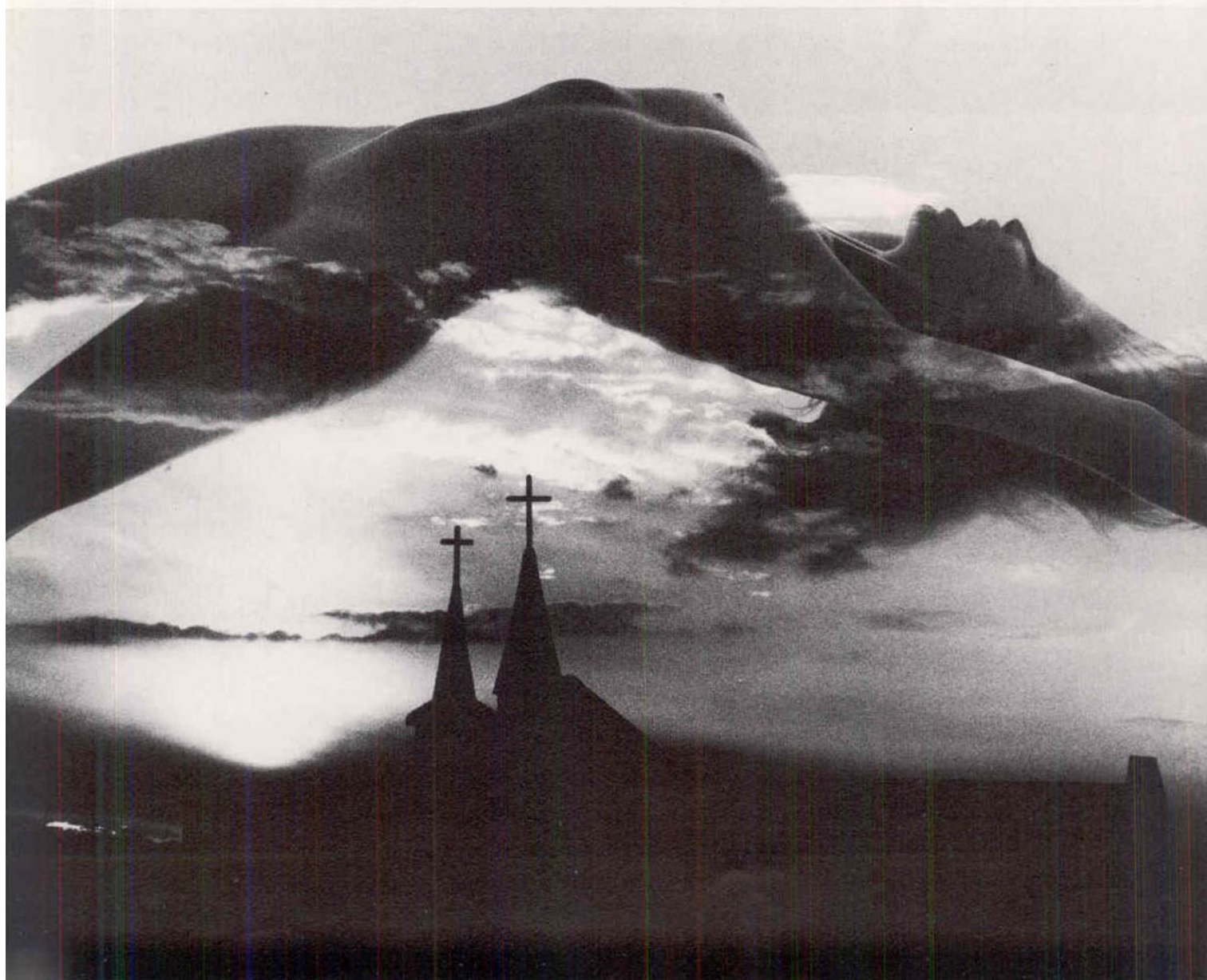
Choosing pairs from your existing stock of negatives can produce some interesting results. If you enjoy combination printing, it may be worth going a stage further and deliberately taking your pictures with an eye to pairing the resulting negatives.

One of the difficulties of combination printing from sandwiches of paired negatives is that exposures tend to be very long, and when this is the case there is a temptation to accept prints that are rather light and do not have good

blacks. Furthermore, a pair of negatives has a much higher printing contrast than the individual negatives and prints, and prints can become excessively contrasty. For these reasons choose negatives which are a little thin and a little soft, so that when they are printed together in this way they can be made to yield a final image of normal contrast and density.

When printing a negative sandwich, you may find it difficult to keep both negatives sufficiently firmly together to keep the image sharp. A glass negative carrier is essential. If you have a glass-

Girl and spire *The sort of unusual combination which is possible by marrying two completely unrelated images. You can shoot scenes specifically to pair negatives*



less carrier which can be removed, you can make a suitable temporary arrangement by flattening the two negatives between two sheets of thin, optically flat glass, such as a 6 x 6 cm slide mount glass. Use a blower brush and an anti-static cleaning cloth to ensure that the sandwich remains clean and free of dust during assembly.

Successive combinations

Negative sandwich combinations are easy to make, but you have much more control over the appearance of the final image by exposing each negative separately. This technique can be taken to fairly sophisticated levels by using jigs specially made for masking parts of the image, but at its simplest level it is little more than an extension of standard dodging techniques.

If, for example, you wish to add clouds to uninteresting sky in a landscape, prepare a card mask such as you would if you were burning-in sky (see pages 222 to 225). Obviously, you can only do this where the horizon is a fairly simple shape. The mask must follow the shape of the landscape when raised above the print surface during use, so trim the card to shape under the projected image beam of the enlarger.

The next stage is to make test prints or strips to determine the correct individual exposure times for the main landscape negative, and for the cloud negative which is printed in afterwards. This also enables you to check quickly the compatibility of the two negatives, which is not always easy unless you have some positive images to go by. Prints of the right enlargement are especially useful.

Once you have established exposure times, you can start making the combination print. It is easiest to produce the landscape part of the print first. Put the landscape negative in the enlarger, check the focus and composition, and make your first exposure. Switch off the enlarger and swing the red filter beneath the lens before switching on again to inspect the image. Now carefully position the mask, and mark its position in relation to the baseboard with a pencil or tape. Switch off the enlarger.

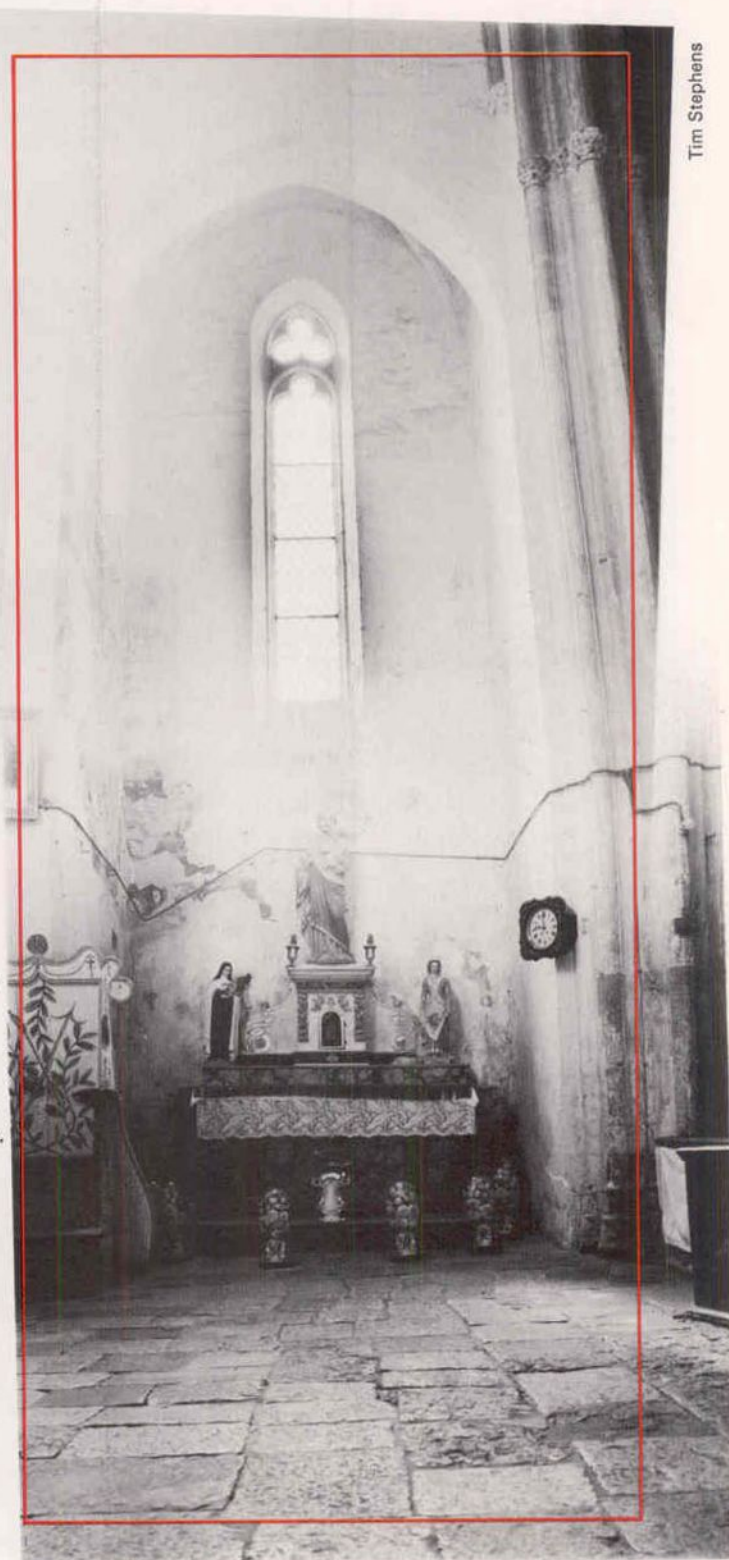
Carefully replace the landscape negative with the cloud negative. Switch on the enlarger and check, through the safety of the red swing filter, that the negative is both in focus and correctly

positioned in relation to the landscape (position indicated by the mask). Switch the enlarger off and move the red swing filter aside. Carefully raise the mask above the print surface, staying within the locating marks you have made on the baseboard, and expose the cloud negative. Keep the mask moving very slightly to help prevent a sharply defined edge.

Although quite straightforward, this form of combination printing is rather

hit or miss, simply because you cannot be sure that the mask is correctly positioned and does not wander during use. Inevitably there is some overlap of detail or a slight gap of relatively clear print. Since you can rarely achieve perfect masking, it is probably better to leave a small gap rather than have any overlap of detail. You can make errors in masking less obvious by slightly shading the border region when printing the cloud negative. This helps to fuse

Wide view *It is often impossible to get the whole of a view into a single shot. But taking two separate shots and combining them may achieve the desired result. Special care is needed in dodging where the two parts of the image overlap. The tones of the image must match*



Tim Stephens

and fade border detail, and because the sky is lighter at the horizon, it looks reasonably natural.

Using a printing jig

While making a single two-negative combination print is fairly straightforward, it is difficult to achieve consistent results over a large run of repeat pictures. When more than two negatives are involved, the problems of combination printing become quite severe. If you intend to do a lot of combination printing, it is almost certainly worth constructing a purpose built jig. This considerably simplifies even straightforward cloud printing.

A jig holds precut masks in position a little above the print. If you make one, check that its size suits the size of paper you use most often. The jig can also be used for dodging. It is especially useful for applications where you may be tempted to use on-print masks (see page 225), but have difficulty in keeping the masks in exact register. Although the jig carries masks which remain still during use, the height of these above the print surface prevents a clear-cut shadow forming. Further softening in this region is possible by gradually shading the mask edges during printing.

To use the jig, focus and compose the main negative on the enlarger easel or masking frame. Stop the lens down as usual and place the jig carefully over the masking frame. Place a sheet of white, but opaque, card on the support glass of the frame, tape it into position, and make a register mark so you can correctly position it later.

Switch off the room light and inspect the projected image, now interrupted by the white card and out of focus. Trace a cutting line for the mask, remove the card and cut along this line. To prevent a white line forming in the boundary region, make sure that the trace and cut are taken slightly within the lighter of any two parts of the projected image. The lighter parts print dark, and there is more chance of disguising the edge of the mask in this way.

You should have a mask in two parts—one corresponding to the landscape, the other to the secondary area in which you plan to print the clouds. This secondary mask can be used to shade all unwanted detail in the sky and to prevent build-up of unwanted tone—if it becomes too dark, any highlights from the cloud part of the combination may be lost. If the cloud negative is very dense, the secondary mask is not necessary.

While the landscape negative is in position, remove the jig and make a test strip or print under normal printing conditions, but do not process it. Put it carefully away and make a separate test print from the cloud negative. Process both test strips together and establish the best exposure times for each.

Place the landscape negative in the enlarger, and load the masking frame with a sheet of paper before positioning the jig. Use the red swing filter to

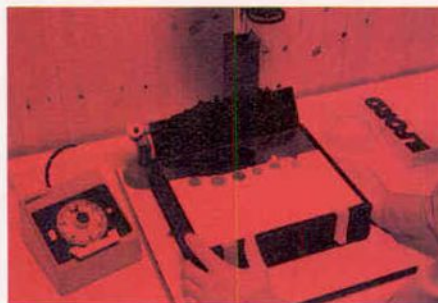
Making a combination print



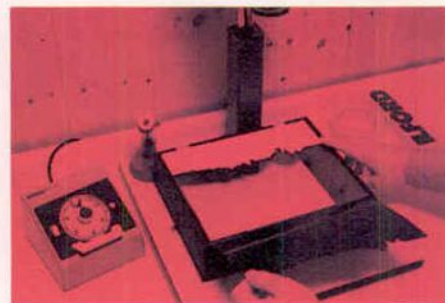
1 Select the two images which are to be combined and make test prints to assess contrast, exposure and size



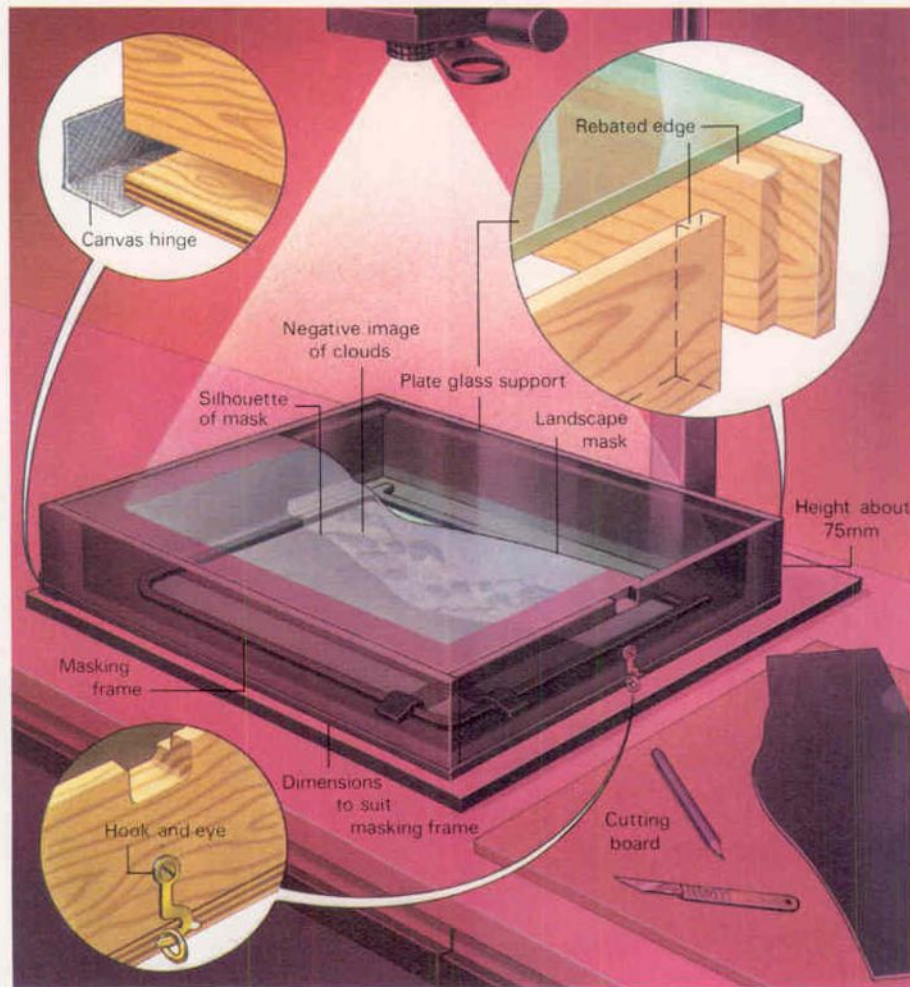
2 Focus the 'land' negative at the print level, position the jig, tape down the masking card and trace off the image



4 Under safelighting, load the jig with printing paper and carefully align the mask with the projected image



5 Now swing the 'sky' mask into exact register with the 'land' mask and flip the latter out of the way





3 Carefully cut along the border between 'sky' and 'land' portions of the mask—a sharp scalpel is best



6 Expose the 'land' image. Weight down the mask edge with small coins, or another sheet of good quality glass



7 Carefully change over negatives and switch to the corresponding mask before exposing the 'sky' negative



8 Process the print normally. If masking lines show, the register has gone out of true and the print needs remaking

Printing jig Make a printing jig to suit your masking frame size, along the lines of the design shown left. This one allows the platform to swing out of the way, and so gives easy access to the print. Masks can be taped to the sides during use

position the jig accurately, and tape down the secondary mask if you decide to use one. Then expose the main part of the print according to your test strip.

After the first exposure, use the red swing filter and carefully position the main mask. Switch off the enlarger and substitute the cloud negative for the landscape negative. Switch on again and check that the sky detail positioning is correct. Switch off and swing the red filter out of the way, and then expose the cloud negative according to your test print findings.

The print can now be processed. Evidence of an overlap or gap shows that you have either knocked the jig during use, or you have positioned the masks inaccurately. Take care, when aligning the masks, not to change the print and negative relationship.

As you become used to the jig technique, other creative possibilities open up. Some of these are examined closely in subsequent issues. The jig can be used for complicated dodging techniques involving filter changes in both colour and b & w printing, as well as more straightforward applications which can be just as effective as combination printing in certain cases.

Stockpiling negatives

A stockpile of 'cloud' and other types of negative for combination printing are probably already in your existing selection of negatives. But once you are familiar with the various combination printing techniques, it becomes almost

second nature to look for various pleasing cloud photographs, for instance, when you are out with your camera. Take several shots of any potentially useful subject.

Building up a collection of negatives allows you great leeway in combination printing. You can match film type with film type, and subject type with subject type. You can also begin to match features such as perspective, relative subject size, and the type of lighting. Backlit clouds, for instance, do not look quite right when printed in combination with a scene which is obviously frontlit, nor do steeply banked clouds taken with a wide angle lens look convincing when printed in combination with a telephoto landscape shot.

If you decide to produce negatives specifically for use in combination printing, shoot to exclude all irrelevant and unwanted detail from the photo. This saves you having to crop it later—and unwanted detail may not only be visible but also actively blocks out any pleasing detail from the other half of the combination. But try not to create 'impossible' perspective distortions.

Once you have mastered the art of combination printing, the darkroom becomes a much more exciting place. Simply filling in cloud detail can turn a mediocre landscape shot into a beautiful picture. There are many other possible combinations—you could add textural detail, for instance. Eventually, you may want to create entirely new pictures in the darkroom.



John Ward

Cottage and clouds Perhaps the most common application of combination printing for improving a picture is adding clouds to an otherwise 'bare' landscape view—but take care that the lighting of clouds and landscape match



Exposure meters

On many modern cameras exposure is automatic, but even the most sophisticated systems can sometimes be fooled into giving the wrong exposure and, consequently, less than ideal results

For good results, accurate exposure is essential; both aperture and shutter speed must be set precisely according to the amount of light available. Yet how do you know how much light there is in order to set the exposure correctly?

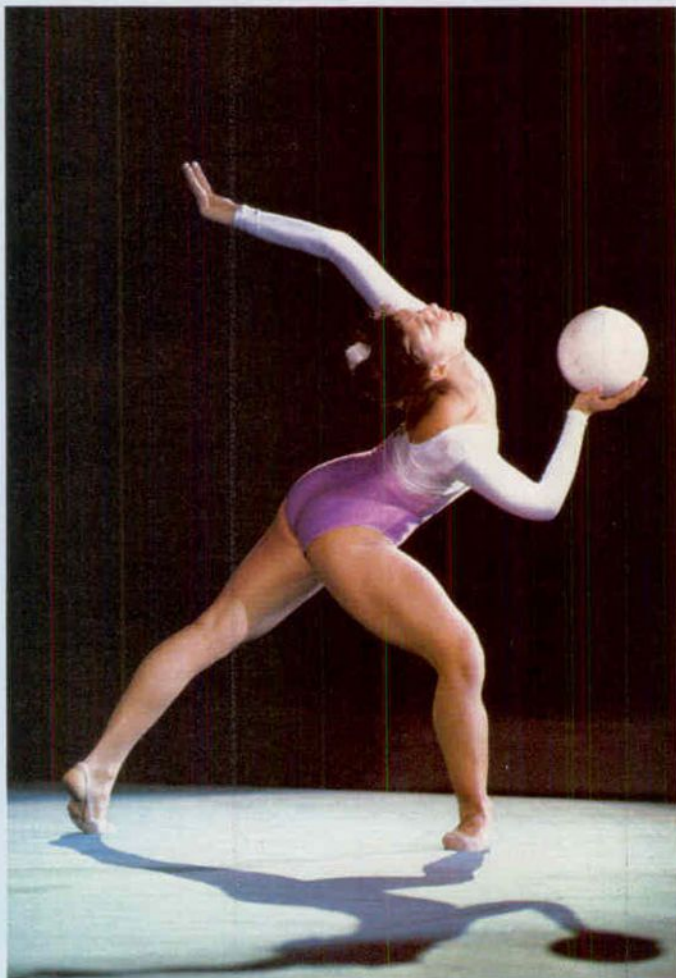
In the early days of photography, there was no means of measuring light, and photographers had to guess on the basis of experience. This worked reasonably well for the simple, outdoor shots common at the time, and many experienced photographers still rely on their own judgement when using black and white film because black and white gives enough exposure latitude to allow small errors. But, in unfamiliar situations or when using colour film, most photographers need an exposure meter to measure the light accurately.

All exposure meters, whether they are separate hand-held meters or built into the camera body, rely on the fact that the properties of certain substances including compounds of gallium, selenium, cadmium and silicon are altered by exposure to light.

When light falls on selenium, for instance, a weak electrical current is generated and the current is proportional to the intensity of the light—the more light that falls on the selenium compound, the more current is generated. By measuring the electricity generated, it is possible to estimate the intensity of light.

With other compounds, light changes electrical resistance. By passing a current through cells made from these compounds the amount of light can be measured simply by metering the change in resistance.

Even though they need no battery to power them, selenium cells are used less than other types because they need to have a large surface area, and are relatively insensitive to low light levels.



Spotlit gymnast Spotmeters measure the light reflected from a small part of the scene—ideal for spotlight subjects



Many hand-held meters do still have selenium cells because a large surface area is not such a disadvantage, but, for built-in meters, they are generally only used on cheap snapshot cameras.

The other types of cell are more useful to designers of more sophisticated cameras. They are sensitive to very low light levels—moonlight is well within the range of a silicon cell meter—and can be made very small in size, so that they are easily incor-

Modern meter The most sophisticated meters now contain microcomputers that indicate the exposure on a digital display

porated into the body of a single lens reflex camera.

Built-in meters

With early built-in units, the meter recorded the light coming through an aperture on the front of the camera. The photographer read off from the meter and adjusted the camera controls to suit the lighting conditions.

All modern built-in meters are linked directly to the aperture and shutter controls, and read light levels not from the subject itself but from the image of the subject formed on the film, or the focusing screen. This method has the advantage of measuring the light through the camera lens, and so if the angle of view of the lens is narrow, so too is the angle of view of the meter.

The very first through-the-lens (TTL) meters took an average reading for brightness over the whole focusing screen. But the more sophisticated cameras that are now on sale measure either the brightness of the centre of the picture only (*spot metering*) or give more emphasis to this area than to the edges (*centre-weighted metering*). In inexperienced hands, centre weighted meters probably produce the most consistent results.

Built-in meters have their drawbacks, however. They work on the basis that every subject is a 'typical' subject. A typical subject is one that has a normal range of tones, some dark, some light, and some in between. It has the principal area of interest in the middle area of the frame and is not strongly lit from the back or the side.

If the subject of the picture is not a typical one, a built-in lightmeter often produces an incorrect reading, and, unless the photographer uses skill and judgement to interpret the meter reading, over- or underexposure results. For this reason, separate, hand-held meters are often used in conjunction with a TTL meter

Tony Duffy/All Sport

Jon Bouchier/Meter Ithaned by Minolta

because if used correctly, they are capable of giving accurate readings in circumstances where TTL meters are prone to error.

Spot meters

By using a small light-sensitive cell, and an arrangement of lenses, it is possible to construct a light meter that measures the brightness of only a small part of the subject. Such meters are called *spot meters*, and have a measuring angle of only one or two degrees. The photographer lines up the meter on the subject through a viewfinder that usually shows the measured area as a small circle within a larger frame.

Since these meters read the light reflected from a small area, they are ideal for circumstances where the important part of the subject is very brightly lit, or very distant. For example, the correct exposure for a figure standing on a stage under a bright spotlight could be measured with a spot meter from the stalls of a theatre.

Incident light meters

Built-in meters can often give incorrect exposure because they are only capable of measuring light reflected from the subject. They can be fooled, therefore, by different toned subjects. A TTL meter works well when the subject is grey, for example, but if it is black, the meter will give extra ex-

White wall A reflected light meter would wrongly compensate for light subjects like this and give less exposure than necessary

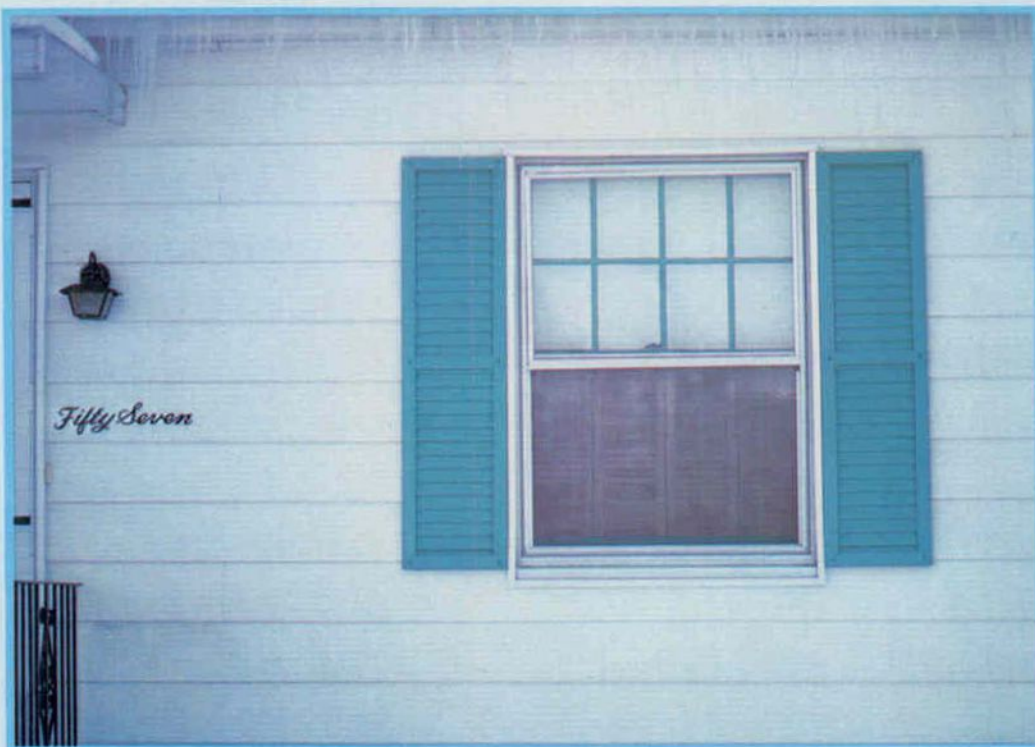
posure so that the black subject appears grey in the final photograph. Conversely, a white subject will be underexposed because the meter again assumes that it is being pointed at something grey in colour and compensates accordingly. Under many circumstances, most particularly

where colour transparency film is being used, a more accurate exposure reading is obtained by measuring the light that falls on the subject, not the light that is reflected back from it.

This is the principle that is used in incident light meters. These have a white plastic dome covering the light sensitive cell, and, instead of holding the meter next to the camera and pointing it at the subject, you stand near the subject and point it at the

camera. Incident light meters therefore give the same results whatever the tone of the subject. Though most useful when colour slide film is in the camera, incident light meters are also invaluable when measuring light for copying.

A lot of the hand-held light meters on the market can be used as either reflected light meters, or as incident light meters—they have a removable dome that can be used when necessary.



Sergio Dorantes

Reflected and incident light meters

Reflected light Built-in meters, and many hand-held ones, measure the light reflected from the subject. This method works well with the average subject but is less successful when there are many dark or light tones in the picture



Incident light Fitting a white plastic panel to the meter converts it so that it measures the light actually falling on the subject. This technique gives good results particularly when using colour transparency film



Jeremy Gower

Teleconverters

If you need a telephoto lens only occasionally, using a teleconverter instead might be the answer. Most are cheap, and double or treble the focal length of the lens with which they are used

Jon Bouchier



The drawbacks

In photographic optics, you very rarely get something for nothing, and teleconverters are no exception. In order to double or treble the focal length of a lens, image brightness has to be sacrificed. When the image is enlarged two times, its brightness falls to only a quarter of what it previously was. This is because the same amount of light is being spread over four times the area. To produce the same exposure on the film, the photographer must use an aperture two stops wider. Thus an $f/2$ standard lens is effectively converted to an $f/4$ 100 mm lens. When a $3\times$ converter is used, the light intensity is cut to one ninth, and a little over 3 stops extra exposure is needed. This can be a severe handicap, particularly in poor light. If your camera does not have a through-the-lens meter, this loss of light must be compensated for when setting the exposure. When light is read through the lens, the camera makes the compensation automatically, and no change in the exposure is needed.

The cheapest teleconverters cost very little indeed. For little more than the cost of processing and printing a roll of colour film you can buy an accessory that doubles the focal length of any lens you own. At the other end of the scale, it is possible to pay nearly ten times as much, and still get a product that performs exactly the same function, and looks very similar, too.

A teleconverter, or *tele-extender* as it was originally known, is a small cylindrical accessory that fits between the camera body and the lens. Although it looks like a proper lens and contains a number of glass lens elements—usually between three and seven—it works only in conjunction with a proper or *prime* lens. The converter simply enlarges the image formed by the prime lens by spreading out the rays of light coming through the lens over a wider area. The degree of enlargement depends on the converter in use. Most converters enlarge the image two or three times, though some give a magnification of as little as $1.4\times$. A few converters have a two-position setting, and offer both $2\times$ and $3\times$. This is achieved by moving the optical components of the converter.

Since teleconverters have a male bayonet mount on one end, and a female on the other, they could theoretically be used with a lens of any focal length. In practice, though, they are used mostly

with lenses of focal lengths in the 50 to 200 mm range. Outside these limits, the quality of the resulting pictures is very poor, unless the converter is specifically matched to the lens in use.

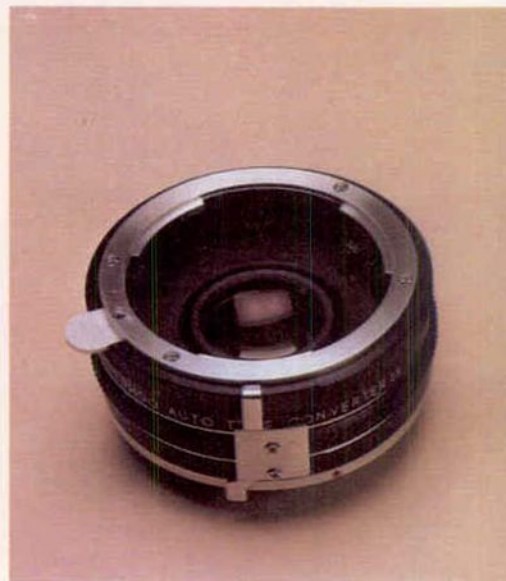
There is little point in using a teleconverter with a wide angle lens, because the combination of lens and converter gives a focal length little different from a standard lens.

Teleconverters are light in weight, and effectively double the potential of a photographer's outfit. This makes them a very attractive proposition. By using a standard lens, a teleconverter and a 135 mm telephoto, a range of four focal lengths from 50 mm to 270 mm is available. The weight and cost is probably little over half that of an outfit made up of prime lenses.

Because they simply enlarge the image formed by the main lens, the closest focusing distance does not change when a converter is attached. This means that teleconverters are very useful for close-up work because they form a large image while allowing the photographer to retain some distance between himself and the subject. With a short lens, the photographer would have to move very close to the subject to get a large image; with a telephoto lens, the minimum focusing distance is normally too great to get close enough to give a similar size image.

Double up The length and weight of a 200 mm lens linked to a teleconverter is much less than that of the 400 mm lens to which it is equivalent

Converter types Cheap converters (left) look similar to costly ones (right) but perform fairly well. Matched multipliers (far right) are available for some zoom lenses, and work best with the lens to which they are matched





River boats *If a matched multiplier is available for a lens, it will give better results than an ordinary converter. The detail above is from a picture taken with a multiplier, the one below used a converter*



The other problem that is encountered with teleconverters is the actual quality of the image. Some converters are poor optically, and actually degrade the image formed by the main lens. Even the best converter is only as good as the prime lens with which it is used, and because the image formed by the main lens is enlarged, so are its aberrations.

In the best possible circumstances, teleconverters can turn in very good

results, but not everyone can afford a top quality converter. This has led to converters being regarded as cheap but poor quality alternatives for those who cannot afford a proper telephoto lens.

These two drawbacks, light loss and poor quality, result from the nature of converters themselves, but there are other problems which are common to both lens/converter combinations and ordinary telephoto lenses.

Any long focal length lens amplifies the effect of camera shake, so a faster shutter speed must be used if the camera and lens is going to be hand-held. A tripod or other camera support allows you to use a slower shutter speed (see page 154) but many photographers find that they prefer to hand-hold the camera because this allows more flexibility.

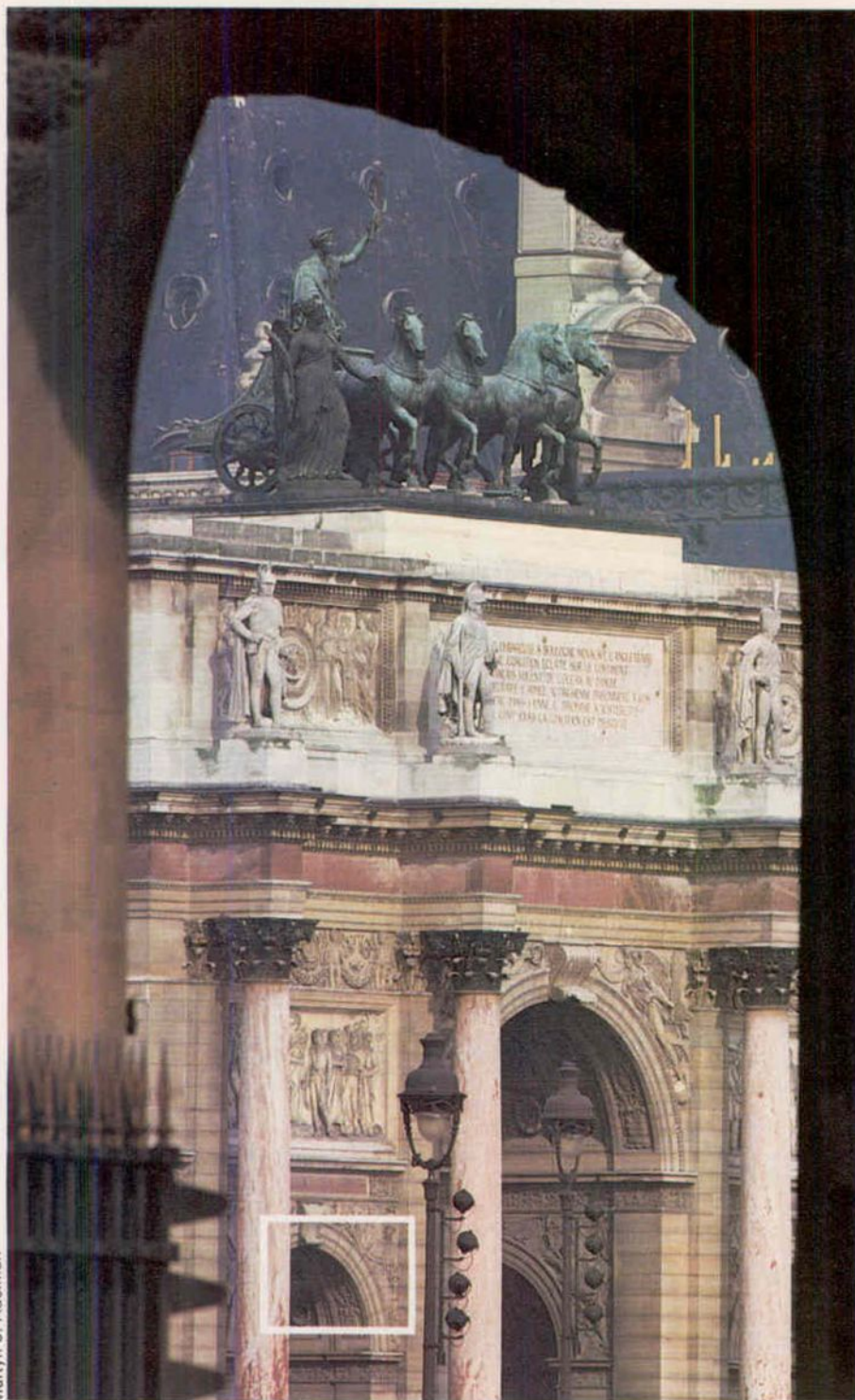
The rule of thumb is that the minimum reliable shutter speed at which a camera



Martyn J. Adelman/Teleconverter by Nikon



Jon Bouchier/Lens and multiplier by Vivitar



Archway view Great enlargement of the picture taken with a 200 mm lens gives poor results, and even a cheap converter can do better. A more costly converter gives slightly better quality, but not as good as a 400 mm lens

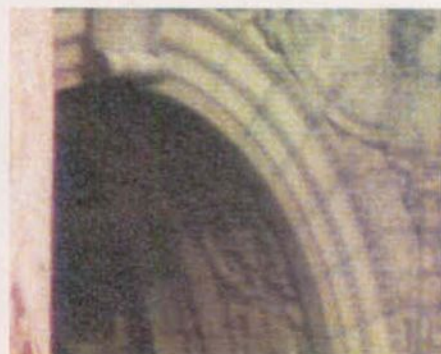
and lens can be hand held is equal to the focal length of the lens in use. A 200 mm lens should not be hand held at speeds slower than about 1/250 sec, for example. If a 2× converter is being used with the same lens, the combination has a focal length of 400 mm, and should only be hand held at speeds faster than about 1/500. Attempts to hand hold at slower speeds may lead to camera shake.

Long lenses limit the depth of field in a picture, and this is true of lenses used

with converters too. The depth of field of a 200 mm lens is the same as that of a 100 mm lens used with a 2× converter, provided that the aperture is the same, and the subject is equally distant. Although shallow depth of field is sometimes acceptable, and often quite desirable, there are some occasions when it is necessary to stop the lens down to increase the depth of field, and this can lead to exposure problems—slow shutter speeds and the risk of camera shake.



200 mm lens—enlarged 40 ×



200 mm lens + Nikon converter 20 ×



200 mm lens + cheap converter 20 ×



400 mm lens alone—enlarged 20 ×

Buying a converter

Converters vary tremendously in price and quality. The cheapest converters can be expected only to produce mediocre results at best, whereas the most expensive ones made by the big camera manufacturers—Nikon, Canon, Pentax and Minolta—can produce pictures which are indistinguishable from those taken through a lens alone.

It may seem surprising that anyone buys a teleconverter which produces

poor results, but the alternative—using only the same lens and greatly enlarging the resulting negative—is sometimes worse. Pictures taken with a cheap teleconverter may be slightly soft around the edges, but this is frequently acceptable. A greatly enlarged negative usually produces extremely grainy prints, and this is often less desirable than the slight loss of definition and contrast that a teleconverter would produce.

It may well be, then, that a very cheap teleconverter would be adequate for your purpose, particularly if your budget is tight, and you do not make big enlargements. If you can afford to, though, it is worth spending more money, because converters costing only slightly more produce pictures which are a lot better.

Very inexpensive converters use few elements, and frequently economize in other areas, too. Mechanically they may not be as well made as those with a slightly higher price tag, and the connections for automatic diaphragm operation may be slightly more 'sloppy'.

Dearer models use more elements—typically five to seven—and this shows up clearly in their superior performance. It is possible to get a good idea of what to expect from a converter by looking at the specification; more elements usually means better quality.

Branded converters

The large camera manufacturers sell teleconverters which are about as expensive as a top quality lens. Since most people think of converters as a cheap alternative to a longer lens, this seems unnecessary. Why buy a teleconverter to use with a 135 mm lens, when for the same money, you could buy quite a good 300 mm lens?

The answer is size and weight. A teleconverter adds very little to the weight of a camera bag, and for a professional who is already carrying three cameras, a motor drive and six lenses, an extra lens might be the last straw. A teleconverter adds only 40 mm or so to the length of a lens, but a separate lens of double the focal length is often double the size. This is a strong point in favour of converters.

The converters made by the big camera manufacturers are precision optical instruments, and are often designed to be used only with lenses of particular focal lengths. At least two manufacturers make one converter for lenses with focal lengths up to 200 mm, and another for longer focal lengths. This is necessary because, for best results, the rear elements of the lens must be close to the front elements of the converter. Long telephoto lenses have recessed rear elements, and converters to be used with them are fitted with protruding front elements which reach into the barrel of the main lens.

Some of the more expensive converters enlarge the image by a factor of 1.4. Though this may seem like an arbitrary figure, it is not. If an image is

enlarged linearly by a factor of 1.4 (to be more precise, 1.412) it will be enlarged in area by a factor of exactly 2. The light loss will similarly be 2, and the exposure compensation required will be exactly one stop. This is more acceptable than the two stop loss that is produced by a 2× converter.

Matched multipliers

A recent development in the field of teleconverters is that of *matched multipliers*. Although these superficially resemble ordinary teleconverters, they are designed at the same time as the lens with which they are to be used, and when attached to it they form an integrated optical unit.

Because they are matched to one lens, these multipliers will not produce good results when used with any other lens. When attached to the matching lens, though, multipliers can give pictures that

are substantially sharper than those taken using the lens with an ordinary converter. Matched multipliers also work very well at short distances, which is where many lenses fall down. The extra elements provide added correction for close-up pictures.

It is impossible to overlook the drawbacks of teleconverters, and it would be misleading to pretend that they are unimportant. Whether the advantages conferred by teleconverters outweigh the disadvantages depends primarily on the type of photography you propose to tackle with them, and what sort of use the pictures will be put to. Teleconverters will never be a real substitute for a full range of lenses, but they double the versatility of an existing outfit at very little cost. Where sharpness is not absolutely critical, they can be a great asset and avoid the cost of a long lens which will only be used occasionally.

Misty portrait *The softness and lack of contrast of cheap converters can be used to advantage. A standard lens and converter are ideal for portraits*



Martyn J. Adelman

Nude

Making a good job of photographing a nude is not easy. To find out how a professional tackles this sort of work, we asked Julian Calder to do a nude assignment for us



There are numerous ways of photographing a nude, but to get good results you have to be very careful about what you are doing. For this assignment Julian Calder carried out the session in an artist's house which doubles as a studio. The building is a spacious open plan design which has a number of large windows and skylights.

Good nude photography is mainly a matter of using light in a way that flatters the model. It was interesting to see how Julian went about making the best use of both the lighting and the location.

To benefit from the amount of natural light in the house, Julian decided not to use any supplementary lighting such as fill-in flash. Just using daylight meant mounting the camera on a tripod for all the shots because most of the work was done with medium telephoto lenses and the shutter speeds were usually about 1/8 or 1/15 second. A bellows type lens hood was also used most of the time.

Julian was always very careful about getting the model positioned in the most

flattering way. This meant constantly checking for background distractions, making the most effective compositions and watching very closely to see how the light fell on the model.

This care and planning is essential to Julian's work: 'Setting up a shot can be a slow business and I never actually start photographing until I am happy with the basic composition and the modelling effect of the light. I only pick up the camera after these basics have been taken care of—it is a mistake to think that you can use up loads of film in the hope that one or two of the shots will work.'

The photograph of the model lying on the rug was taken from a balcony about five metres above. To frame the shot exactly, an 80-200 mm zoom was used.

'Filters are essential to make a shot like this work well,' Julian explained. 'The natural light was very cold so I had to warm it up with filters—especially as I was using Ektachrome film. I fitted an 81C filter to do this but I also used a



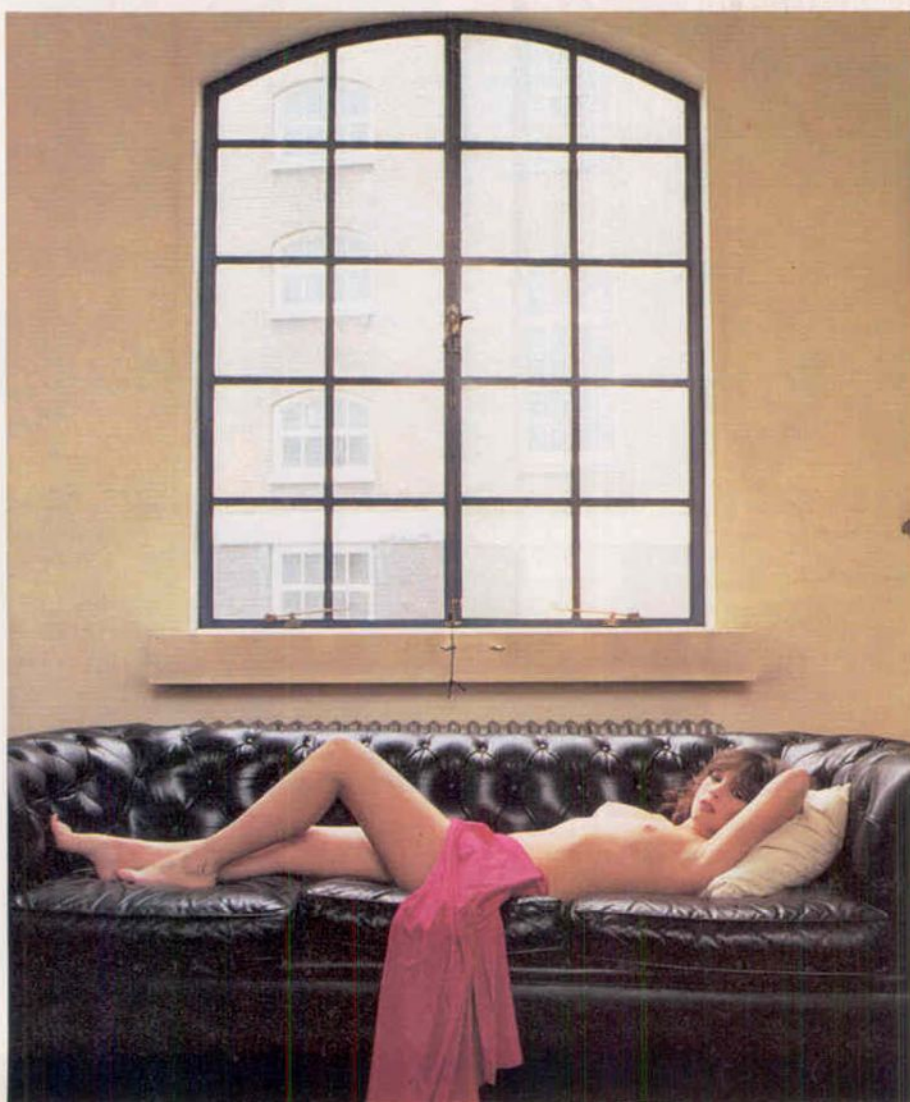


Above Backlit with reflector. Nikon FE, 135 mm lens at $f/8$, $1/8$ sec, Ektachrome 64

Left Toplit from skylights. Nikon F2A, 80-200 mm zoom, $1/30$ sec, $f/5.6$

Right Backlit. Nikon FE, 28 mm $f/2$ lens, $1/15$ sec, $f/5.6$, Ektachrome 64

Below Toplit and sidelit. Nikon F2A. 80-200 mm zoom, $1/15$ sec, $f/8$, Ektachrome 64





Softar 2 soft focus filter. A 5R gelatin filter was also added to bring out the red in the rug and the colour of the model's lips and skin. I use soft focus quite often for this sort of work because it gives such flattering results.'

The shot on the rug was taken directly beneath the large skylights, but this flat toplighting is not necessarily the most flattering. To get more modelling in the skin tones, Julian tried a different location. On the sofa in front of some paintings there was still some of the top lighting from the skylights in the roof, but this was diffused by drawing translucent blinds across them. Side-lighting from a large window to the left of the model also gave an increased modelling effect. The sofa was angled slightly to catch this window light and, once again, 81C and Softar 2 filters were used.

Upstairs there was a room which was lit solely by one large window—which proved an ideal location for a backlit shot. Positioning the Chesterfield sofa squarely in front of the window, Julian used a 28 mm lens so that he could include the entire window.

'This was one of the main shots I had planned. But you don't have to have a complete range of shots already in mind when you start—things always occur to you as you begin the session. Often it's best not to have a rigid schedule so that you can let your shots develop out of the circumstances—the model, the location and the lighting.'

For the backlit shots on the sofa Julian was very careful to adjust the

Toplighting Nikon FE 135 mm f/2 lens, 1/30 sec, f/4, Ektachrome 64

Front and toplighting Nikon FE, 80-200 mm zoom, 1/30 sec, f/4.5, Ektachrome 400



exposure so the details outside the window were lost and so the model's face was lit. Light reflected from the magnolia walls helped to fill in the darker areas of the model's skin, but in the closer version of the shot, taken with a 135 mm lens, a reflector board

was used to add detail. An 81 EF filter was used to give the model's skin a tanned appearance.

The shot on the balcony was taken with the zoom lens set at about 200 mm. Again, the 81 EF filter was used. Julian pointed out: 'You have to be careful with telephoto shots like this. If an arm or a leg is pointing towards the camera, its relationship with the rest of the model will be distorted so the arm looks shorter than it really is'.

The shot of the model standing with a pink flower in her hair and a pink scarf around her waist was also done with the soft focus filter. Instead of the 81 EF, Julian used the less warm 81C filter to retain the cool, pale tones. Few props were used during the session—Julian thinks they should be kept to a minimum in nude work, but there is a case for adding a splash of colour to shots like this.

Julian was pleased with the way the session went: 'I always prefer to use natural light for nudes whenever possible. The softness of the light is much better than the effects of flash. Few people have perfect bodies so you have to work to find the best ways of lighting the subject in a flattering way.'

The proper use of a reflector board is an important aspect of this sort of available light photography. This is linked to Julian's concern for the way daylight falls upon the model. It is always possible to see where extra light is needed and the results can be seen through the viewfinder if someone adjusts the angle of the board for you.



Hans Reinhard

For Hans Reinhard, wildlife photography is not just a profession but an expression of a whole way of life. Many of his most intimate portraits of animals and birds are taken near his home in Bavaria



Hans Reinhard/Bruce Coleman Ltd

High on the slopes of the Odenwald valley near Heidelberg, a short, stocky figure looking like a Bavarian farmer strides up the hill carrying a bucket of meal. As he walks, he calls out to all the animals in his care—donkeys, goats, sheep, chickens, geese and even a lame deer—and they respond with a flurry of sound, rushing to greet him as he opens the gate. It is feeding time at Hans Reinhard's private zoo.

At 39, Reinhard is one of Germany's foremost wildlife photographers and his

Devoted friend *The otter seen here being fed by Reinhard was his constant companion after he rescued it*



Amorous call *Reinhard used a long lens to isolate this red deer stag bellowing for its mate in the rutting season*

work is reproduced all over the world, in nature books and on posters, in calendars and on chocolate boxes. His work is his life. Wildlife is both his first love and his profession.

He lives, as he has always lived, in a quiet house on the edge of a pine forest, close to nature and close to his subject matter. The house is a haven for wildlife. Deer jump over the fence, foxes make their dens close by and you may find a raccoon hiding in the washing machine.

It is a place where sick and injured



Forest scene Reinhard spotted this wild boar on one of his early morning walks in the forest near his home

animals can recover before returning to the wild. Hans is known throughout the Odenwald region for his love of wildlife, and people often bring him sick animals to tend. At the moment he has a crippled deer, brought to him after it got caught in a grass cutting machine; but he also has two other deer, a mother and her baby, who moved in of their own accord after sheltering from a snow storm.

Very often, animals become so attached to Hans that even when they recover and he returns them to the forest, they come back for food and companionship. A falcon that had broken a wing still flies in for the occasional visit, while an otter he bought from a dealer to release from captivity became totally devoted and followed him everywhere, even on his

walks through the forest.

Sometimes, the attachment of the animals in his care can provide some wonderful opportunities for photographs. Once, for instance, he found a fox that he had nursed living close to the house with a den full of cubs, four years after returning to the wild. He was able to dig a hole close to her den and then make a small tunnel through to the den for his camera so that he could photograph the foxes actually in their den. It provided some wonderful photographs and an interesting discovery.

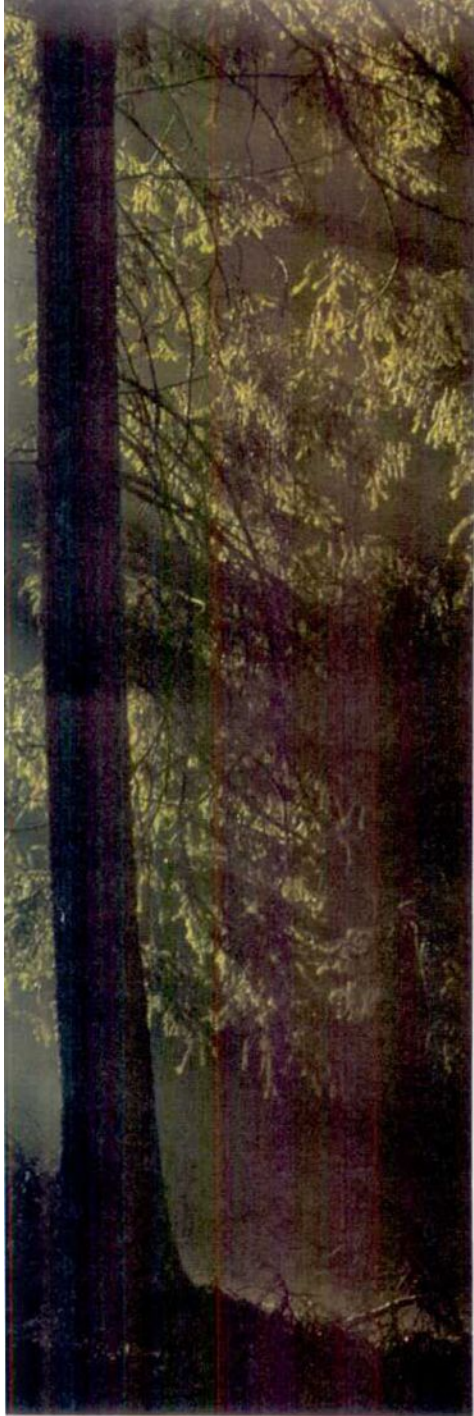
On several occasions, the vixen returned to the den carrying a chicken. Hans was fascinated and soon became thoroughly involved in photographing the foxes at their meals. It was not until some time later that he realized the chickens were coming from his own back yard.

Some of Reinhard's most appealing

photographs are totally unplanned, like the one of the wild pig he encountered on an early morning walk caught in a shaft of sunlight beneath the tall pines, but most of his work is the result of patience and meticulous attention to detail.

For bird photographs, for instance, he searches the forest for a suitable nest and then spends hours carefully watching the birds flying in and out until he knows their exact flightpath. Once he is sure of their habits he goes home to collect his little tractor and trailer and returns to the nest laden with equipment for building a hide.

The hide is usually set up about ten metres from the nest to start with, but once the birds become accustomed to its presence, he carefully moves it in closer until he is barely two metres from the nest. From this position, he can get intimate close-ups of the mother bird feeding her young. For this sort of shot,



Hans Reinhard/Zefa

Hans Reinhard/Bruce Coleman Ltd

Hans Reinhard/Zefa



Lion cub at play Shooting at 1/1000 second at f/4, Reinhard used a Pentax 6 × 7 to capture this delightful shot

Wood white butterfly Simple shots like these are often the result of long periods of patient waiting

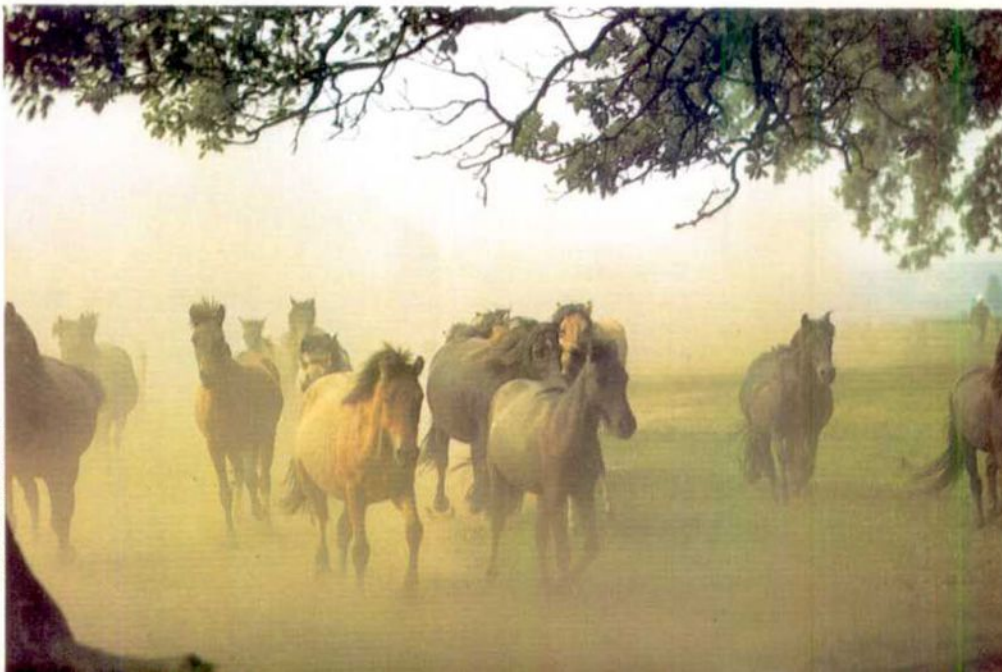
Wild horses at Dulmener Lacking a good background, Reinhard had used the branches of a tree to frame his picture

the camera is usually a motor-driven Hasselblad equipped with a long lens and loaded with five metre lengths of Agfa 70 mm film.

One of Hans' specialties is beautiful action shots of birds in flight. Some of the most spectacular are taken at night. This type of shot would be impossible without some sort of mechanical assistance, and he has devised his own technique.

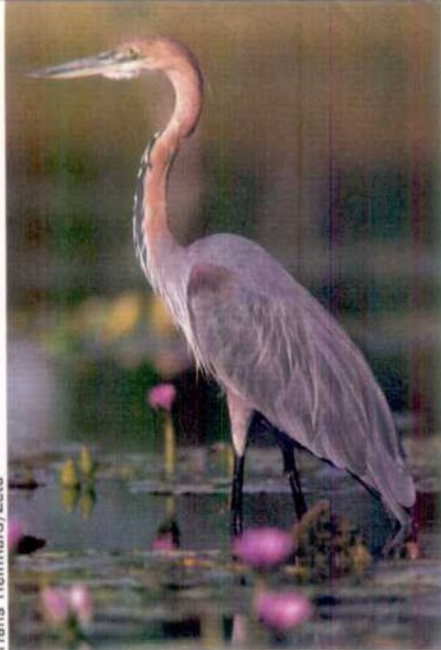
Since birds nearly always follow the

Hans Reinhard/Zefa





Hans Reinhard/Zefa



Hans Reinhard/Zefa

same flightpaths to and from their nest, Hans can set up a beam of infrared light across the flightpath. His camera and a powerful flash are pointed at the beam of light and connected to it electronically. When a bird flies across the beam and interrupts it, the flash and the camera shutter are triggered. With luck, the result is a perfect photograph of a bird in flight.

Of course, the bird is not always in precisely the right pose when the picture is taken and it may take many attempts before Hans gets the shot he wants. Unfortunately, the process is time consuming because it produces only one picture a night. It can take two weeks to get the right shot, but at least Hans can be home in bed instead of huddling for hours behind a camouflage of branches.

Hides vary enormously. Sometimes he builds a raised platform covered with branches. At other times, he may build a hide on the ground using logs and waterproof sheeting. Even his house provides a useful hide. From his window, he can see the deer feeding at the forest's edge and decide precisely where to put his camera for the best shots. The hide depends on the type of shot.

Over the years Hans has built up a large stock of equipment. It includes two Hasselblads with built-in motor drives, two Pentax 6 × 7 cm SLRs, two Mamiya RB67s and a 5 × 4 inch view camera. When photographing animals in the wild he uses a Hasselblad or Pentax—preferring the Pentax in poor light as it takes faster lenses. If he is taking pictures of fish or flowers, however, when speed is less essential, he prefers the Mamiya RB 67 as he finds it easier to move around with. He also appreciates the Mamiya's rotating camera back, which makes it possible to switch from a horizontal to a vertical format without having to move the camera body.

His favourite flash unit is the Mannesmann-Multiblit, which can be used with

Jumping cat Domestic animals can also make interesting subjects. Here Reinhard's own cat is caught in mid-air

up to six separate flash tubes. It is no longer made, nor do repairers know how to mend it and he has to comb the camera shops for old stock to repair it when any parts fail, but he has not yet found anything to match its performance.

He never uses a light meter, maintaining that only ten in a thousand of his pictures are wrongly exposed. 'I have

Wading grey heron Reinhard used a long lens to avoid disturbing this heron as it foraged for food in the lake

worked with colleagues who always use light meters and still get it wrong. Experience teaches you the correct exposure. If I am in the forest taking photographs of an animal in the open, how can I take a reading in time?'

Despite numerous tempting offers, he has never felt inclined to accept commissioned work from his clients, because



Hans Reinhard/Zefa

Caught in flight A flash unit set up at a friend's barn was triggered when this snowy owl flew through an infrared beam

Carpet of spider's webs Reinhard rose at dawn so that he could catch the dew on these webs in the early morning sunlight

they would then retain the copyright on his photos. He has always preferred to build up his own library of photographs, which has now grown to over 200,000 transparencies.

Although the bulk of his photography is taken outside his own back door, he often makes speculative trips abroad to photograph particular subjects that interest him. He has been to Hungary to photograph horses, to Switzerland for alpine flowers, deer and mountain goats, and to Kenya for his spectacular photos of elephants.

Hans goes on safari every other year to build up his library stock of big game pictures. He uses his time to best advantage by rising at dawn and setting off into the game reserves with a driver and a local guide who is expert at spotting game from long distances. Most of his photographs are taken in the early morning or late afternoon when the light is soft and the shadows less harsh. On these trips, Hans uses extra long lenses on his Hasselblad or Pentax 6 x 7 cm.

Yet however much he has enjoyed these trips, he is always pleased to return to his house in the countryside and to the wildlife that forms such a central part of his life.

Curious ermine In order to outline the ermine's winter coat Reinhard waited until it moved into a dark setting

Looking into the lion's den Taken in the early morning at the Amboseli National Park in Kenya

Hans Reinhard/Bruce Coleman Ltd



Hans Reinhard/Zefa



Hans Reinhard/Zefa



Choosing black & white film

High speed and grainy, slow speed and quality, or a compromise for the occasion—how should you choose black and white film?

Ever since high quality colour film became widely and cheaply available, there has been a steady decline in the popularity of black and white, yet there are many good reasons for loading your camera with black and white film every now and then.

Press photographers often choose monochrome simply because this is what is needed by the newspapers, but there are many subjects that actually have more impact in black and white than they do in colour. Candid shots are a prime example—it is no accident that photographers like Henri Cartier-Bresson still work almost exclusively in black and white. But perhaps the most convincing reason for using monochrome occasionally is that it is just that much easier, quicker and cheaper to develop and print at home.

Panchromatic films

Since most people see the world in colour, black and white films are essentially quite unlike the real world, but when looking at a black and white print, we expect the tones of grey to be similar in brightness to the colours in the original scene.

There used to be two kinds of monochrome film for use in cameras: *ortho-*

chromatic and *panchromatic*. Orthochromatic film was the first type of film available, and was only sensitive to blue and green light. This insensitivity to orange and red used to give pictures shot on orthochromatic film their own distinct characteristics. In portraits, for instance, flesh tones were darkened and skin blemishes accentuated. Similarly, bright scarlet flowers or fire engines would come out solid black in prints made from ortho negatives. Naturally, this sort of peculiarity made orthochromatic film unpopular as soon as there was a suitable film to replace it, and it is now no longer used for general photographic purposes.

Black and white films are now all panchromatic, which means that they are sensitive to all colours of visible light. Even modern panchromatic films are slightly less sensitive to red than other colours and inaccurately react to deep reds. But since the human eye cannot distinguish many colours at the red end of the spectrum, this hardly matters. Panchromatic films are also slightly oversensitive to blue and undersensitive to green, but their response is still sufficiently close to that of the human eye to give an acceptably 'real' looking tonal representation of colours.

Fast films

When choosing a black and white film, the most important consideration is the film's speed. At first glance, fast film seems to be the obvious choice. Fast film makes photography possible even when the light is very low, such as in the home by ordinary room lighting, or in the city after dark. If the light is good, a fast film allows you to use the fastest shutter speeds to arrest rapid movement, in conjunction with fairly small lens apertures to retain reasonable depth of field. With scenes calling for maximum depth of field, a fast film may permit the lens to be stopped right down as far as it will go and yet still enable you to use a fast enough shutter speed to avoid the effects of camera shake.

Since fast films are so versatile you may wonder why anybody bothers with slower films at all. Unfortunately, fast film has certain disadvantages. Its emulsion is made up from much larger silver halide crystals than are found in slower emulsions. This means that the silver particles formed during development are also large. The image produced by fast films is therefore coarse and granular and all but the smallest enlargements look very grainy.

Even when the grain pattern is not



obtrusive, a grainy image does not look very sharp and its *resolution* is poor—that is, it does not reveal very fine detail.

Sometimes, the coarse, grainy image can be very attractive, but it is rarely successful for a subject full of fine detail.

Special developers designed to keep grain to a minimum are available but the most effective of these also cause some loss of emulsion speed. A film that has a nominal speed of, say, 400 ASA (ISO) may prove to be no faster than perhaps 250 ASA when processed in a very fine grain developer. If you want fine grain, it is far better to choose a medium speed film and to develop it in a normal developer in the usual way.

Generally speaking, fast films are less sharp and give worse resolution than a medium speed or slow film, but the 400 ASA films of today still give very good results. Films such as Ilford HP5 and Kodak Tri-X, both rated at 400 ASA, can almost be regarded as universal films provided that they are exposed and processed correctly.

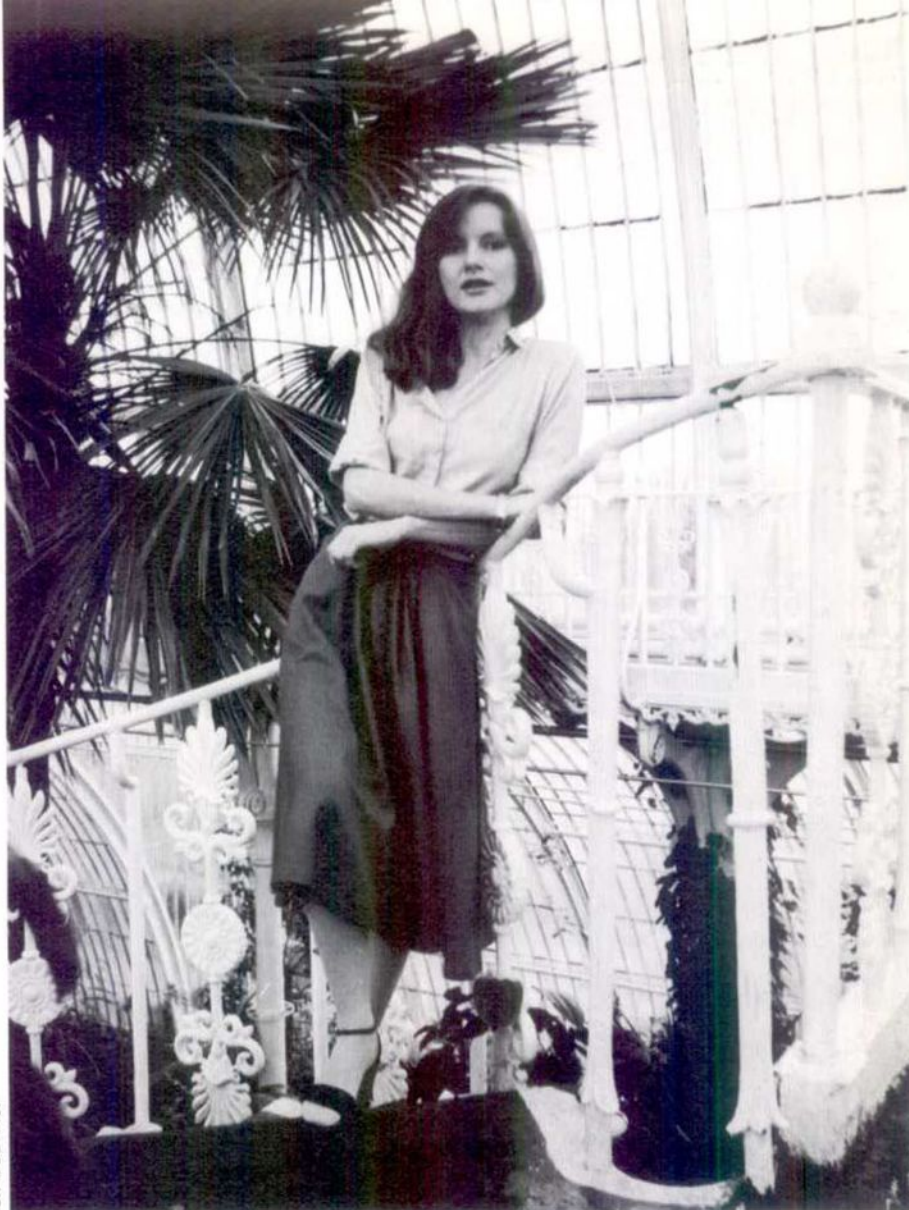
Push processing

Under very adverse lighting conditions even a 400 ASA film may not be fast enough. By using a very active developer or giving longer development than normal, the effective speed of a film can be increased substantially.

Image quality is reduced but by this *push processing* you may have just the extra film speed to get a shot in conditions that would otherwise be too dark for photography. It is better to push the

Palm house To show the difference between various film speeds the same scene was shot on fast, medium, slow and chromogenic films

Jon Bouchier

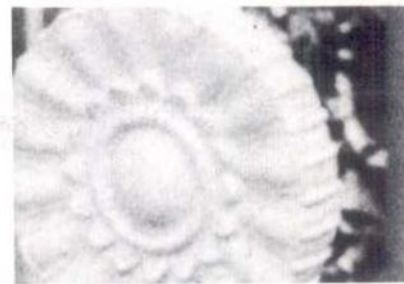


Fast film



400 ASA. Examples—Kodak Tri-X, Ilford HP5, Agfapan 400

Medium speed film



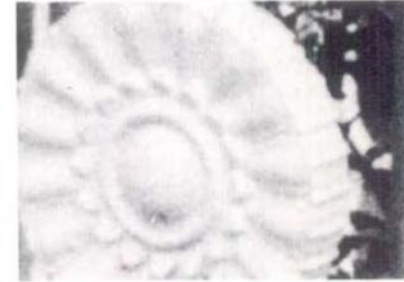
80-125 ASA. Examples—Kodak Plus-X, Ilford FP4, Agfapan 100

Slow film



25-40 ASA. Kodak Panatomic X, Ilford Pan F, Agfapan 25

Chromogenic film



400 ASA. Examples—Agfa Vario XL, Ilford XPI

Jon Bouchier



film speed only when shooting a subject that has a low contrast range, because pushing increases contrast. Graininess is also greatly increased and sharpness is slightly reduced by prolonged development but this is part of the price to be paid for the extra speed.

Critics of fast films usually point to their grainy images and general lack of sharpness as reasons for using slower films. Although these criticisms are quite valid, there are a number of other factors which complicate the issue. The quality of any photographic image is affected not only by the negative, but also by the quality of the lens and the steadiness of the camera during exposure. Lenses only give their best results when stopped down from their maximum aperture, and with slow films this may not be possible. Camera shake can often only be eliminated by using a fast shutter speed and again this may not be possible with a slow film. So a fast film may actually give a higher quality image than a slow film, despite the extra grain and reduced sharpness.

Slow, fine grain films

The slowest available black and white films are about one tenth the speed of the fastest. They are not as versatile as fast films, but they yield very sharp negatives with so little grain that even on big enlargements graininess is hardly detectable. These films give good image quality even with small cameras, and with a slow film results on a 35 mm camera can be almost as good as on

much larger format cameras.

An important difference between slow and fast films is in their exposure range or *latitude*. A fast film has a wider exposure latitude than a slow one, which means that it is better able to record high contrast subjects correctly. When shooting into the sun, the subject contrast is generally too high for the exposure range of a very slow film and some gradation and detail is lost in either highlights or shadows—sometimes both. A wide exposure latitude also means that for each subject a fast film tolerates more inaccuracy in exposure than a slow one. The exposure latitude of a fast film can be an insurance against failure in situations where it may be difficult to arrive at the correct exposure.

Nevertheless, although the narrow exposure latitude of slow films is a disadvantage, it rarely proves to be a problem in the kind of situation where you want to use a slow film. Even the slowest films have exposure ranges wide enough to cope with most scenes.

Slow film is most useful when the photographer has full control over all the variables in a picture. This is true in the studio, where the amount of light, the direction from which it comes and the contrast of the scene, can all be controlled. Slow film is also widely used for copying. Here, too, all of the variables are controlled by the photographer, and the camera is always on a stand, so the slow film speed is not a handicap. Fast films cannot give good enough quality to be used for copying.

Sun and trees When there is plenty of light and you need high quality results, use slow film—these give fine grain and good definition

Medium speed films

Medium speed films are essentially a compromise between speed and quality, giving better sharpness and finer grain than fast film, while retaining a practical emulsion speed. They may also give you more control over exposure.

It is not always essential to have the fastest possible film in the camera, and in some circumstances, it can be a disadvantage. In bright sunlight, a 400 ASA film needs an exposure of about 1/500 second at $f/16$, and this can often cause the photographer problems. You may, for example, want to photograph someone in a busy city street, with traffic whizzing by in the background. At this exposure, all the vehicles are in focus, because at $f/16$ there is considerable depth of field and the fast shutter speed also records everything clearly. The result is a distracting cluttered background.

On many cameras, the only solution to the problem is to use a slightly slower film. By using a medium speed film, the photographer could open up the lens by a couple of stops or use a slower shutter speed to blur the background.

The advantages of finer grain and better sharpness are obvious when prints bigger than about 30 cm wide are made. Prints from 400 ASA film almost invariably show grain at this enlarge-

ment, and medium speed films allow larger pictures to be printed without intrusive grain.

Chromogenic films

A relatively recent development in black and white films has been the introduction of emulsions based on the technology of colour films. Both Agfa and Ilford have introduced b & w films of this type, though they are not universally available.

There are a number of advantages in using chromogenic films. The most significant of these is lack of grain—both films have a very fine grain structure, and though they are fast (nominally 400 ASA) they have grain as fine as medium speed films. This means that you can make bigger enlargements than would be possible from negatives on conventional film without grain becoming obtrusive.

A second advantage is the exposure latitude of chromogenic films. The Agfa film has speed rating of 'between 125 and 1600 ASA', and exposures made anywhere in this range will result in satisfactory negatives. The Ilford film has a recommended speed of 400 ASA, though it too has comparable exposure latitude. Both films produce best results when exposed at 400 ASA.

Finally, both new technology films can be 'pushed' to faster speeds by changing the development time of the film (see page 395). In this way, they can be rated at speeds as high as 3200 ASA.

Chromogenic films undoubtedly offer considerable advantages. The fact that they can be processed in the same chemicals as colour negative films is a great attraction for a working photographer, and for processing laboratories which usually find ordinary black and white film a nuisance because it requires special treatment. It seems likely that



Janine Wiedel

Children at play *If you need fine grain but there is not enough light to use slow film, then medium speed film offers a reasonable compromise*

Coal miner *Fast black and white film is the obvious choice when the light is low and it is impossible to use any kind of supplementary illumination*



Ed Buziak

improvements will continue to be made in these films, and they could at some point supersede conventional black and white films altogether. For the home processor, though, the advantages must be weighed against the inconvenience of using unfamiliar chemicals at higher temperatures, or else sending the film off to be processed.

Despite the versatility of modern high speed films, it is always worth choosing a film to suit the conditions as precisely as possible. But if you have no idea what you may be photographing, the only reasonable choice is a fast film, just in case you have to shoot in very low light levels. Chromogenic films are also a very attractive proposition.

If a film is wanted for a known assignment there is little difficulty in choosing the best one for the job. Slow film must be the choice when biting sharpness and fine detail are wanted. Fast emulsions take care of low light conditions and fast moving subjects. The compromise choice of a medium speed film offers, if not the best, at least some of the advantages of both fast and slow black and white films.

Understanding...

Automatic exposure on simple cameras

Even some of the cheapest cameras now have automatic exposure, which is often controlled by a remarkably simple mechanism

Advances in basic camera technology over the years have meant that, nowadays, nearly every 'snapshot' camera is automatic. The photographer no longer has to estimate the light and make a complex series of adjustments to the camera controls or be content with shooting in a very limited range of situations. He simply points the camera and shoots, and the camera mechanism adjusts the shutter speed or aperture, or both, to give the correct exposure.

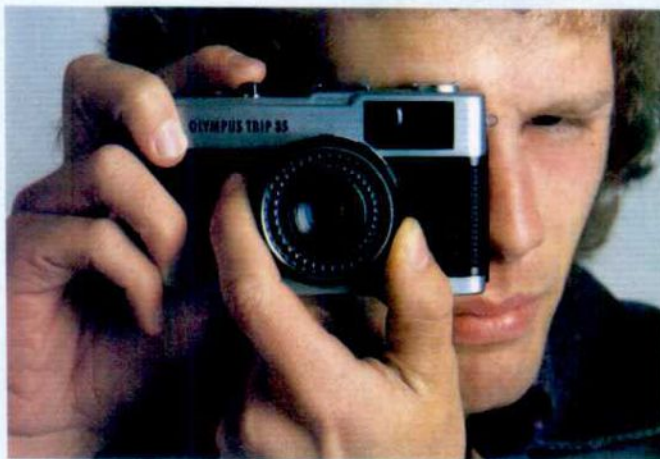
Exposure automation

The best way to understand how exposure automation works is to look at a simple practical example. Many 35 mm compact cameras use a system known as *trapped needle*, and the following example is based on the system used in the Olympus Trip camera. The explanation has been slightly simplified for the sake of clarity.

The first stage in setting the exposure is performed by a selenium photocell which produces a current when light falls on it. As the cell must be fairly large (see page 364), it is usually in the form of a ring surrounding the camera lens.

To keep the angle of 'view' or acceptance of the photocell to roughly the same as the angle of view of the lens, the cell is covered with a clear plastic panel, moulded with a series of crude lenses. Light falling on the camera from outside the angle of view is refracted out again, and never reaches the light sensitive cell. The transparent panel also serves to protect the cell.

The current generated in the photocell by the light falling on it is measured by a sensitive galvanometer. The needle of this meter is visible in the viewfinder on some models, where it moves



Snapshotter Auto-exposure cameras, such as the Olympus Trip, use the pressure on the shutter release to set the aperture

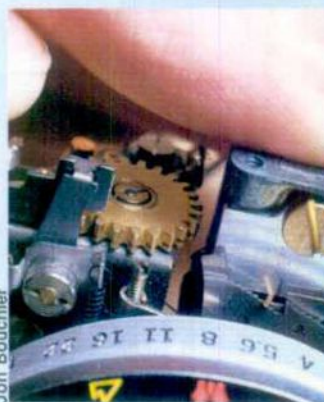
across a scale of aperture values to indicate the exposure being given to the film. The more light that falls on the photocell, the more current flows, and the further the needle is deflected.

Gentle pressure on the shutter release causes a metal plate to move upwards until it engages on the galvanometer needle.

This metal plate controls the lens aperture—the further up the plate moves, the wider the lens aperture becomes. How far the metal plate moves before trapping the meter needle and coming to rest, is dictated by the position of the needle itself. The top of the plate is shaped like the teeth of a saw, and when the needle on the meter has moved a long way to the left, the metal plate moves up only a short distance and a small aperture is set. This happens in bright light. In dim light, the needle is deflected only a little, the plate moves a long way before trapping it, and a wide aperture is set.

If there is insufficient light to take a picture, the needle hardly moves at all, and a shutter lock is engaged which prevents a picture from being

Exposure mechanism The tiny stepped bar on the lower right engages with the meter needle to set the aperture



Jon Bouchier

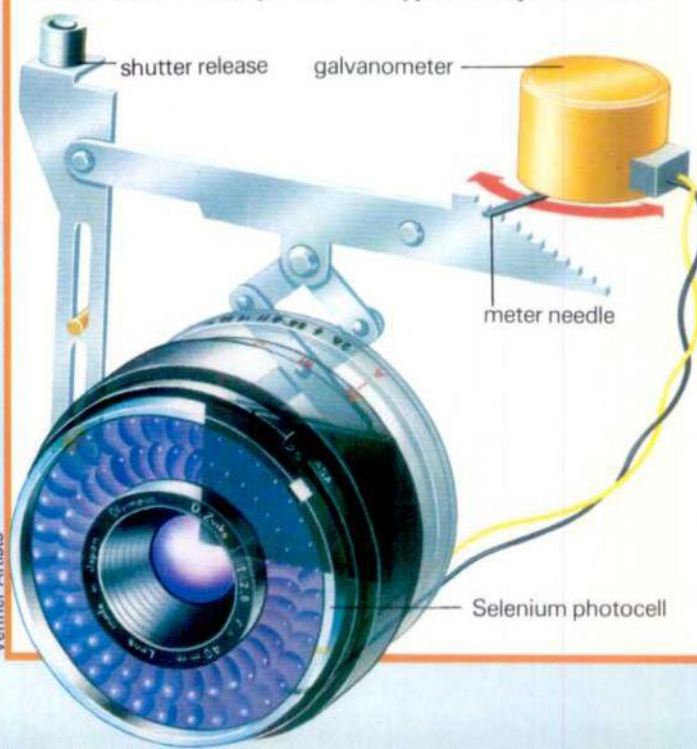
taken. A red flag is simultaneously raised in the viewfinder to indicate that flash should be used.

If there is sufficient light, full pressure on the shutter

release button opens the shutter for a fixed time. The type usually used is a leaf shutter (see page 110) which means that the whole of the exposure setting mechanism

Trapped needle cameras

Simple auto-exposure cameras use a system called *trapped needle* to set the correct exposure. This schematic diagram shows the method of operation of a typical compact camera



Verner Artists

can be incorporated in a pod around the lens, and the body of the camera is just a shell that houses the film.

This description is very general, and a lot of trapped needle cameras, including the Olympus Trip, have an auxiliary trapped needle device which sets the shutter speed in the same way as the aperture. This results in an exposure program which starts in very dim light with an aperture of $f/2.8$ and a shutter speed of $1/40$ sec, and gradually closes the lens aperture to $f/11$ as the light gets brighter. At this point, a change-over takes place and the camera opens the lens aperture again to $f/5.6$. Simultaneously the shutter speed changes to $1/200$ sec. As the light gets brighter still, the aperture is then gradually closed to $f/22$.

These cameras can be used with film that ranges from 25 to 400 ASA (ISO), allowing you to work with slow colour slide film on the one hand, and the fastest black and white and colour films on the other. Setting the speed of your chosen film usually involves turning a ring that controls a mask operating in front of the photocell. For fast film, the whole of the cell area is exposed to the light and needle deflection is great.

For slow films much of it is covered, so the needle moves less far across the scale.

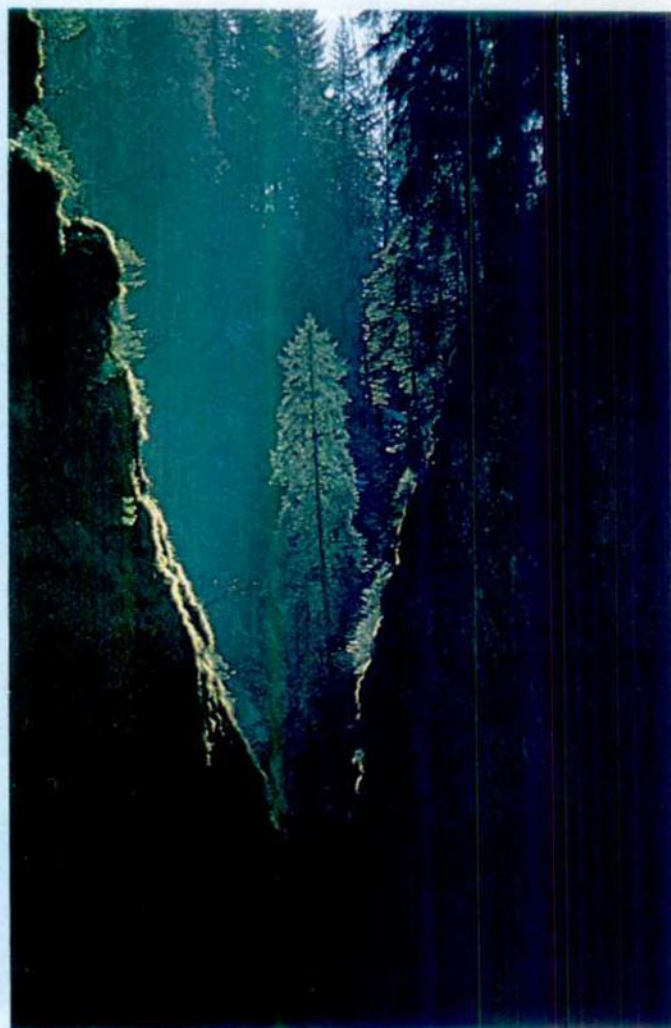
Perfect exposure?

Quite apart from convenience, there are obvious advantages in having an automatic exposure system. For example, not having to transfer any meter readings to camera settings means that errors are reduced. Small format films such as 35 mm demand precision in this respect if the sharpness and grain characteristics of a film are to be used properly. Even so, automatics are not perfect.

The simple automatic compact camera with a selenium cell encircling the lens tends to be influenced by bright areas outside the field of view of the lens, unlike through-the-lens metering systems. In particular, a large expanse of very light sky can so affect the meter that underexposure results.

Developments

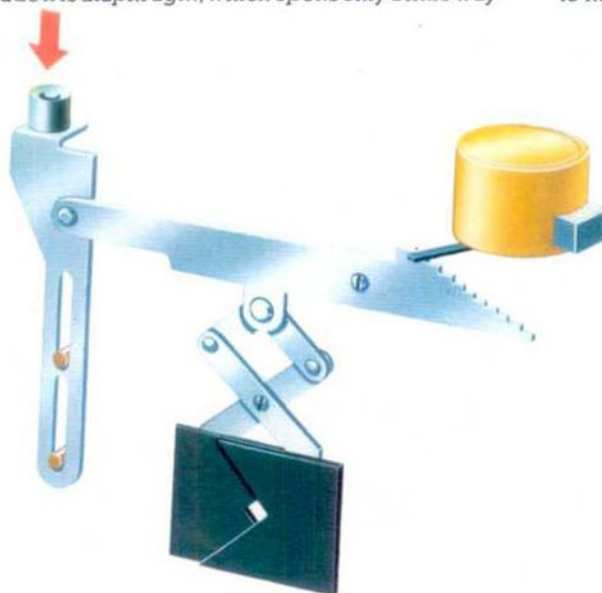
The mechanical control of shutter speeds is gradually being superseded by electronic shutter systems, and although many snapshot cameras are still mechanically operated, it seems likely that electronic automatic cameras will become the rule rather than the exception in the next few years.



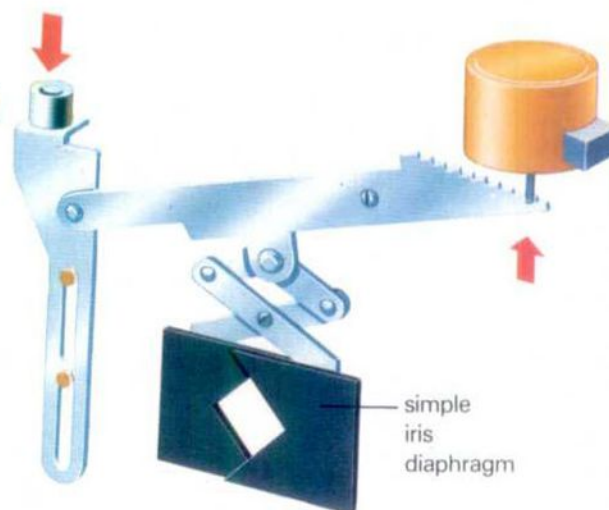
Horst Munzig/Susan Griggs Agency

Tree view Simple automatic cameras give poor results when a dark or light tone dominates the whole picture

In bright light, the galvanometer needle swings a long way across, and pressure on the shutter release quickly traps the needle against a stepped metal bar. This is linked to a simple twin blade iris diaphragm, which opens only a little way



When the light level is low, the meter needle moves less far, and the stepped bar can move a long way before trapping it. The increased travel of the bar allows the iris diaphragm to move farther, and so a wider aperture is set



John de Visser



Sky and Clouds

The sky and clouds may not at first seem to be vital elements of a photograph. But they can change the whole composition and feel of any outdoor scene and, if they are treated carefully, they will provide interesting subjects in their own right

Most people who photograph landscapes, buildings and other outdoor subjects include the sky and clouds as part of the composition, but rarely are they considered as subject matter in their own right. Nevertheless, beautiful images can be produced by emphasizing the shape and patterns of the clouds and by exploiting the colours of the sky. Sunrises and sunsets are popular subjects for this sort of photography, but there are many less obvious ways of adding interest to your shots by featuring the sky.

Quite often the difference between a dull country view and a dramatic landscape depends on the nature of the sky. In a black and white photograph, in particular, a pale blue or grey sky can present a large area of flat tone that takes all the life from the scene. Yet with a sky full of interesting cloud formations, the same scene is trans-

formed. If you are able to, it is worth waiting for the right weather conditions to give a dramatic sky. But even if you cannot, it is worth thinking carefully about how much sky to include in the frame as you compose your shots.

By including a large area you can emphasize weather conditions or just the open space above the subject. Low lying landscapes, for instance, may often be photographed effectively by placing the horizon in the lower part of the frame so the sky is dominant. By placing the horizon line higher, more emphasis is given to the foreground and middle ground detail. Choosing where to place the horizon in the frame is important and it is possible to alter the composition completely according to the balance of foreground and background you have decided to select.

Choosing the point at which to place the horizon in the frame is particularly



Gareth Lovett Jones

relevant to landscape photography. A relatively uninteresting view can be turned into a dramatic shot if you choose a day when the sky has distinct cloud formations and if you frame the shot so that the sky becomes an important feature of the composition. Related to this is the decision as to whether or not the camera should be held horizontally or vertically according to the expanse of

sky you wish to include.

In most cases sky and clouds can be used as a background which supports and reinforces the main subject material. A strong blue, cloudless sky is ideal as a backdrop for strong colourful shots. This sort of sky lends itself to being used in conjunction with other strong colours.

Piles of hay *This shot is effective because of the quality of light but also because of the dramatic storm clouds which add interest to this Alberta field*

Solitary tree *Black and white film is also good for emphasizing the sky in a shot. The delicate clouds and the low horizon make this an attractive landscape shot*

Frosty field *This field and old machinery form an attractive subject, but it is the inclusion of a large area of sky that really makes this photograph work*

Bold reds, greens and yellows stand out very well next to a deep blue sky, particularly when a polarizing filter is used to increase the colour saturation. Heavily polarized blue skies contrast very dramatically with highly coloured objects such as balloons or the sails of boats; but bright, clear weather is definitely preferable for such subjects.

If you live in a country where cloudless blue skies are not a regular feature, you will still find you can frequently use the sky to your advantage. Clouds on their own, or spread across a blue sky, can be interesting features of general outdoor scenes, and are also worthy subjects in their own right.

If you decide to feature the sky in a composition you should usually keep the horizon level relatively low in the frame. In terms of composition, it may also be a good idea to wait until an attractive cloud formation is above

another point of interest in the frame. It may well pay to take the shot with a formation hanging over a hill, a building, a group of trees or some other subject.

In summer the large cauliflower-like cumulus clouds are a regular feature of the landscape. The contrasts between the fluffy texture of the clouds and the clear expanse of blue make attractive shots. Taking a small area of one cloud in relation to the sky may allow you to compose a purely abstract and graphic picture which emphasizes texture and colour. By using a telephoto lens it is possible to isolate details on the face of the cloud which can be used for a study of the tonal variations from white to dark grey. Cumulus clouds often have areas of very dark cloud in the lower half of the formation which can also be used to contrast with the other tones.

If you want to take photographs which show the shape of cumulus clouds you will have to find a high enough vantage point to be close to the level of the cloud. From this point you may be able to view the formation moving towards you and the tall domes of each cloud can be seen. You can either take shots of the clouds themselves or of the formation dominating the landscape. If you cannot reach high ground, you can still get striking wide angle shots which accentuate the menacing appearance of the clouds as they pass overhead.

In contrast to the imposing appearance of cumulus cloud, cirrus clouds are much lighter and finer. By including cirrus clouds in a landscape you can create a feeling of spaciousness, especially if you frame the shot so that a relatively large area of sky is included.

You can produce interesting shots by photographing cirrus and cumulus together, as the difference between shape, size and texture can create rhythms in a composition—in vertical frame format for instance, an area of cumulus in the bottom third of the frame with the rest of the frame filled with a pale blue sky is very effective. The addition of cirrus cloud to break up the strength of the blue sky, adds a great deal to both the composition, and more importantly, the feel of the photograph. The textural difference between the puffy and woolly cumulus, and the smooth, fine, almost feathery feel of cirrus is also worth trying to capture.

A well composed photograph of cloud formations taken together or singly can appear almost as an abstract painting. Clouds are often affected by the light reflected from other clouds, or direct light from the sun. The variations of contrast on the surface of a cloud quite often span the whole tonal range—from white, through light grey to dark grey and black. Remember also, that as the day passes the light changes colour, sometimes dramatically. These changes of light intensity and colour value, can bring into view numerous possibilities of colour and tonal relationships.

At the beginning of the day, the light is soft—pinks, purples, yellows and



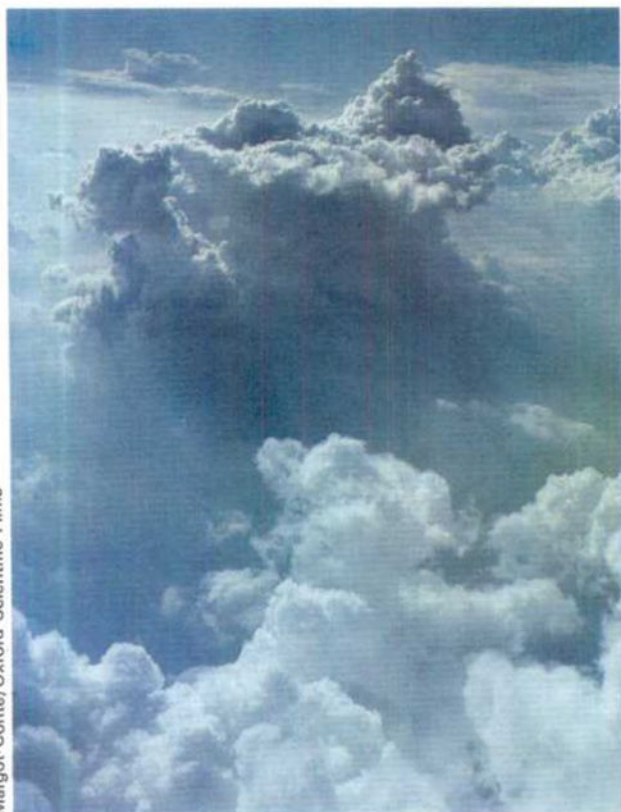
W. F. Davidson/Zefa



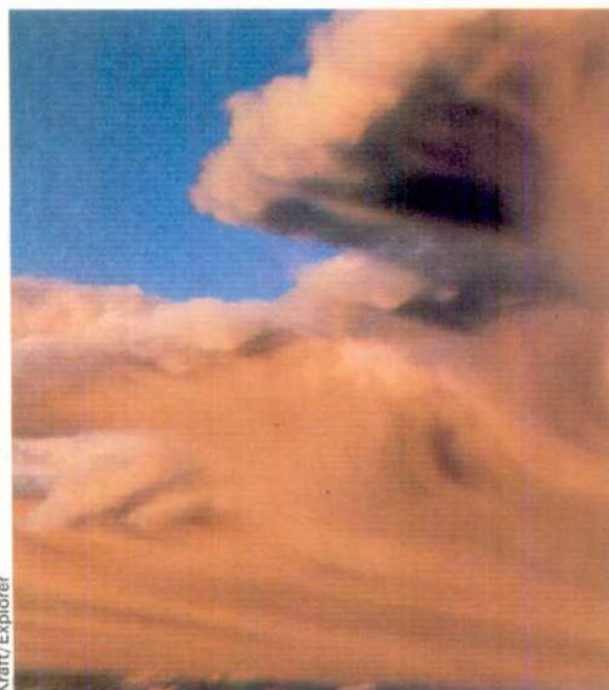
Clouds for their own sake *The shapes of these stratus and cumulus clouds are valid photographic subjects in their own right*

Aerial view *The texture and fluffy shapes of these cumulus clouds are always changing in appearance and can be approached in a number of different ways*

Margot Conte/Oxford Scientific Films



Kraft/Explorer



Bright colour *Clouds can be very effectively photographed just for their colour. These unusual clouds were heavily tinted by particles of dust after the eruption of Mount St Helens, Washington, in 1980*

Waterscape *The uniform ceiling of colourful cloud formation adds an extra photographic element to this attractive composition of mist and water*

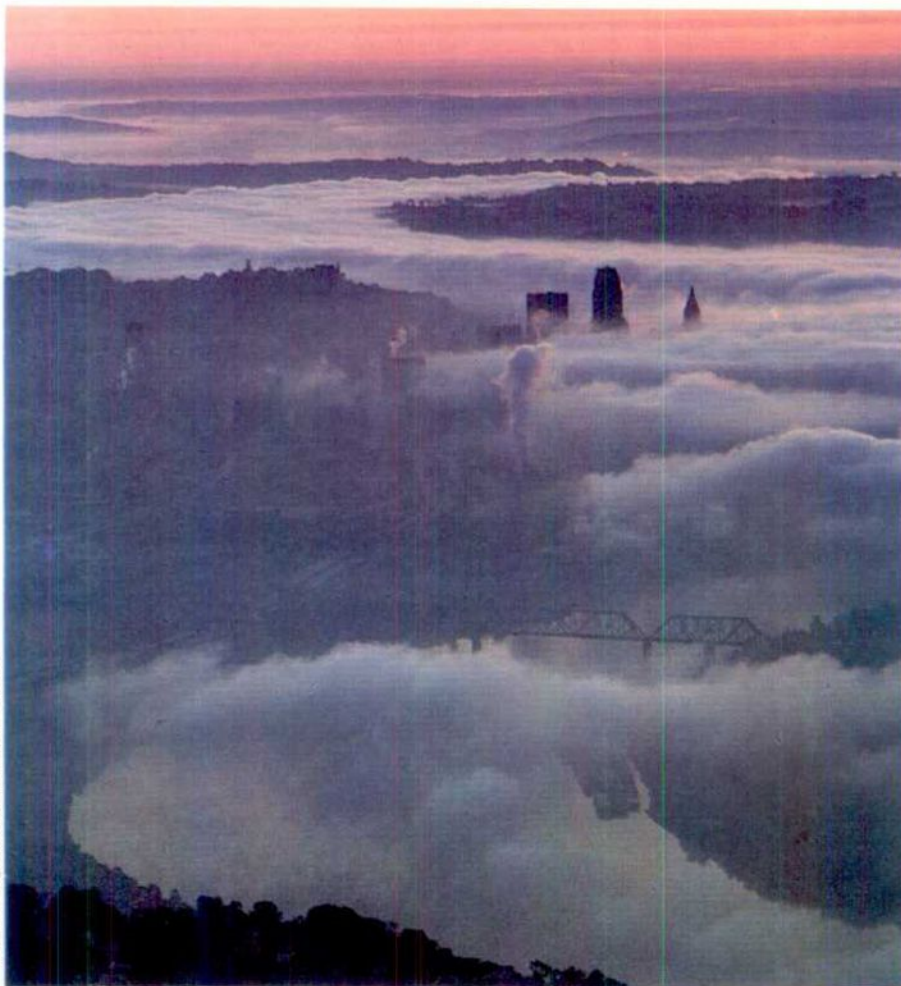
Long exposure *Using a long shutter speed, a deep blue sky has been composed carefully and photographed to include the moon and the even layers of colour*

Victor Watts



David Gallant





oranges can be found on the cloud surfaces together with subtle directional light, which graduates the tonal ranges within these colours. To pick out interesting details of the clouds themselves you will probably need a telephoto lens.

Make the most of the colour relationships. Try not only framing the areas of colour in an interesting way, but think about the way different colours either work in harmony with each other, or against each other. Cold colours give a feeling of detachment, whereas warm colours give the feeling of invitation into a scene, whether it be an abstract or a landscape.

Tones of these colours can be changed by over- or underexposure, so if you are not happy with the colours as they are, you can strengthen them so that they appear deeper and more powerful. On transparency film, this is done by under exposure; to achieve the opposite effect of lightening the subject, over-

Urban scene *Clouds, smoke and mist work together to add considerable atmosphere and interest to this aerial view of a cityscape and the Ohio River*

Backlit clouds *Backlighting is a technique that not only gives an attractive light source to the subject but can also pick out their outlines*

Reflections *The clouds and their reflections in the water are both attractive and useful in underlining the space and the emptiness surrounding this house*



expose. It is not advisable to underexpose more than two stops, and over-exposure is best limited to one and a half stops. Totally changing the colour, or accentuating the colour of a scene however, can be done with the use of filters.

During mid-morning, the use of b & w may prove more successful than colour film. The reason for this is that the cloud is lit by a hard strong sidelight, which can be very dramatic. Black and white film gives an apparently higher tonal contrast than colour film. The unlit areas of the cloud are distinctly dark in tone, whereas the side that is lit holds an acceptable tonal value of white. With a careful eye, this effect can be used particularly with cumulus and alto-cumulus to form a construction of tonal shapes, and a pattern can be built up.

Late in the day the tonal values between one side of the cloud and the other will be similar to those found in morning light. The colours falling on the

both time consuming and painstaking work, but the results of such patience can be well worth the hours spent.

To take advantage of the best light many landscape photographers go out of their way to find the best spot for composing their shots. Having found a prime location they often wait around for exactly the right light for the sky and clouds to look their most dramatic and contrast effectively with the rest of the scene. The same view can be photographed to take on a completely different appearance according to the variety of lighting and weather conditions which occur at different times. If the sky has a dramatic appearance, you will often find it worthwhile to visit places you know it will complement.

Before and after thunderstorm light are examples of lighting conditions that are worth going out of your way to find. You may come across this unusual type of light by chance, but it is prob-

only a hint of skyline at the top. Because the foreground is the dominant element and the sky is only included to place the scene in a spatial context, the quality of the sky becomes unimportant.

Another way of exploiting the sky is to artificially alter the way it appears on the final photograph. One method is to take the photograph normally and to superimpose an image of a dramatic sky after the film has been processed. This can be done with transparencies by sandwiching two slides together to form a single image or, with negative film, in the darkroom by a process of combination printing. If you want to do this, it is worthwhile collecting a stock of photographs of dramatic skies so they can be used in this way.

A quicker and simpler way of transforming the sky is to use graduated filters. A graduated neutral density filter, for example, can be used to exaggerate contrast between clouds and sky.

Julian Calder



surface of the clouds are often strong enough to use in relation to the sky behind them. Cirrocumulus—commonly known as 'mackerel sky'—is perhaps the most effective cloud form to use, and when isolated into separate areas can produce striking pattern effects. High-light colours on the clouds' surface and overall background colour of the sky can be remarkably similar in tonal quality, which means that the effect of depth is lost. Finding an area where the individual clouds make up an interesting composition in the viewfinder, may be

ably easier to use creatively where these conditions occur frequently or are relatively predictable. Composition will largely be determined by the visual impact of the sky, but unless it is so dramatic that it forms a picture in its own right, it is best to look for an additional pictorial element such as a building or a group of trees.

On days when the sky is filled with stratus, or other rather uninteresting types of clouds, there are a number of things you can do to liven up the shot. One way is to frame the shot so there is

Alternatively, you can use coloured graduated filters to completely alter the original appearance of the scene. These filters are manufactured in graduated pinks, reds, blues, sepias and other colours. They can create a blue sky on a cloudy day, give the appearance of a sunrise or a sunset or they can introduce a completely unreal appearance. Such filters can be effective when used at the right time, but do not use them constantly, the effect will become tedious. Besides, sky and clouds offer plenty of scope for experimentation.

Improve your technique

Using a twin lens reflex

Most photographers use 35 mm cameras, and are perfectly satisfied with the results they produce. But there are times when it pays to switch to a larger film size—such as that used by roll film TLRs



Camera and film Although they use much larger film than 35 mm cameras, TLRs are light, reasonably compact for their format, and easy to use

Photographers at work In bygone years, the TLR was a great favourite of press photographers. Note the variety of camera holding techniques

Cutaway view In the TLR, viewing and taking lenses are separate, and the shutter and aperture mechanisms are inside the taking lens

Afternoon drinks Lateral reversal in the viewfinder makes pictures of moving subjects difficult, but does not interfere with more sedate shots



Julian Nieman/Susan Griggs Agency

Although the SLR is by far the most popular camera with amateurs for its versatility and ease of handling, there are times when you can improve your results significantly by switching to an alternative type of camera. In situations where you want to shoot unobtrusively, for instance, or for shots in which technical quality is paramount, a twin lens reflex (TLR) camera can score heavily over a 35 mm SLR.

The TLR gets its name from its separate viewing and picture-taking systems. Two lenses are mounted on a movable panel. The upper lens is used simply for viewing the subject and has a fixed aperture, while the lower lens focuses the image on the film for the photograph. Like the lens on an SLR, the lower lens incorporates a diaphragm to vary the aperture, but it also incorporates the shutter mechanism.

Both upper and lower lenses have the same focal length and are coupled mechanically. When you turn the focusing knob, which moves the two lenses together on the lens panel, both of the lenses are in or out of focus together. A pop-up magnifier built into the viewing hood helps with focusing.

An unobtrusive camera

One advantage of the separate viewing system of the TLR is that the mirror that reflects the image on to the viewfinder screen does not have to be flicked out of the way as the shutter is pressed. This means that the mirror can be fixed and the camera is quiet and virtually vibration-free—a particularly desirable asset when you want to keep your subject from being distracted by the noise of a shutter being released.

When photographing a play or a golf match, for example, the noise of an SLR can make you positively unpopular. The almost silent shutter of the TLR is a great advantage and when taking candid portraits, the quietness of the TLR can be even more important. The abrupt click of the SLR can draw attention to you and prevent you from taking candid shots of your subject unobserved. With a TLR, however, even if you are seen, your subject may not instantly realize you are taking pictures because the camera is held at waist level.

The unobtrusiveness of the TLR can be valuable even in a formal photographic session. With its quiet shutter and waist level viewpoint, the TLR is far less intimi-



dating to the subject than an SLR. Because you do not disappear behind an aggressive looking camera, you can maintain eye contact with your subject after framing up the picture and help to relax them. Subjects may not even know exactly when you are taking the shot. As a result, the subject's movements and expressions remain relaxed and natural and you reduce the tendency of many subjects to freeze their expression until they hear the loud click of the shutter.

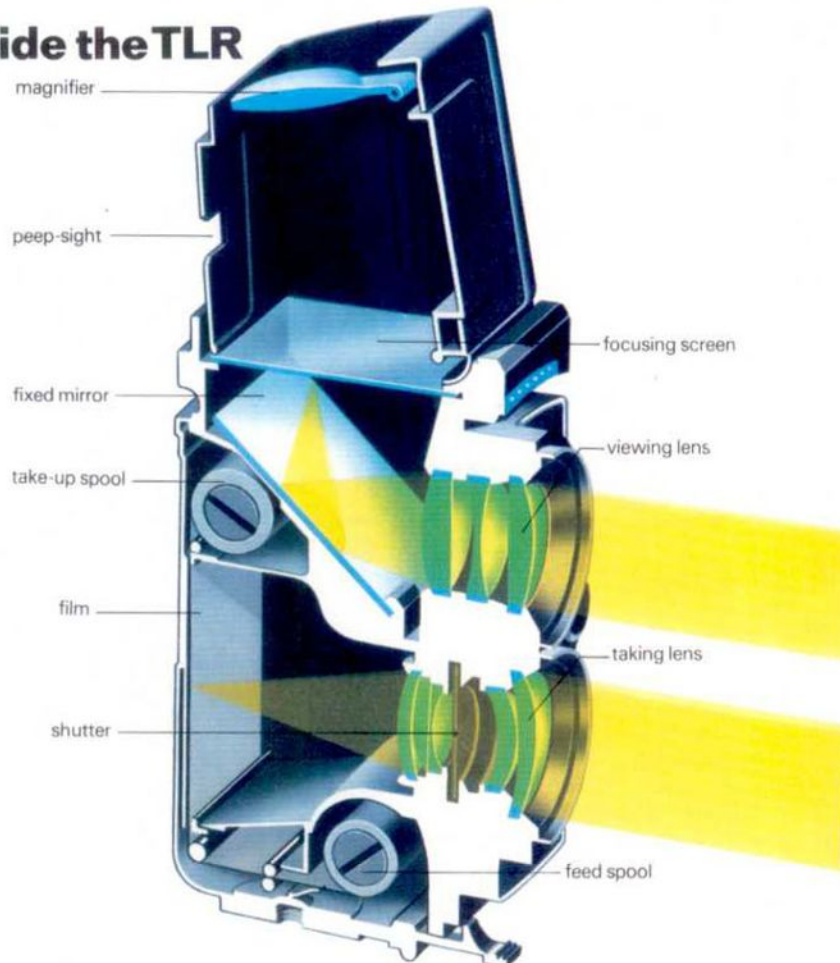
Handling roll film

Most TLR cameras take roll film, which may be strange to those who have used nothing but 35 mm film. Roll film has no perforations, and for TLR cameras is spooled in 12 or 24 exposure lengths. The 12 exposure type is called 120 film, while that with 24 exposures is called 220 film. 220 film is approximately the same length as a 36 exposure length of 35 mm film. To keep light from the film it is spooled up with a length of opaque backing paper which carries frame numbers on the back for use with cameras that are not fitted with automatic winding systems, and alignment marks for those cameras which are. The backing paper of 120 film is much longer than the film itself and enables the spool to be handled, loaded and unloaded in normal light. Roll film is more lightproof than 35 mm film in a cassette, and provided it is always kept tightly spooled and not allowed to



Fox Photos

Inside the TLR



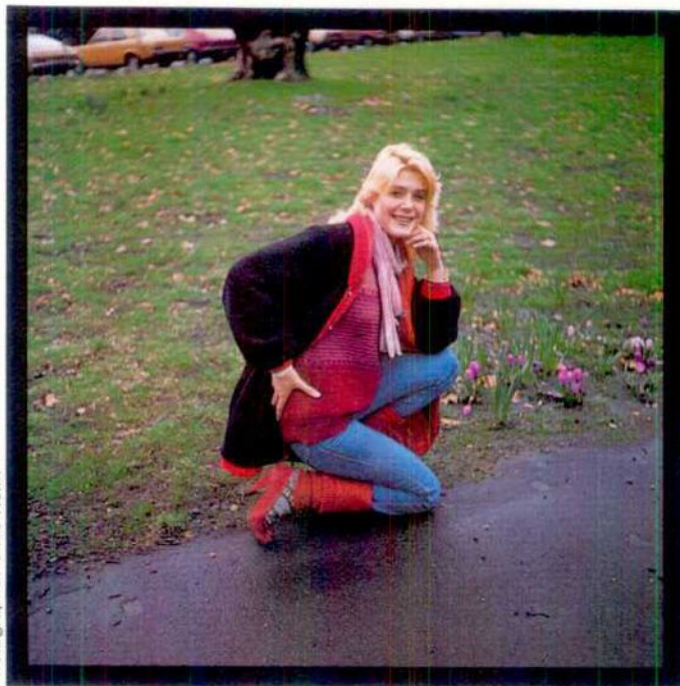
spring uncoiled can be handled in full sunlight without any risk of fogging.

There is no difficulty in developing roll film providing you use the right equipment. Developing tanks are available with adjustable spirals to take both roll film and 35 mm film. These work well. When loading the tank in the dark, the backing paper is unrolled and the film detached from it. In the case of 120 film, the film is attached to the backing paper by a strip of adhesive tape at one end. The 220 film does not have continuous backing paper, but has a shorter strip at each end of the film. The tape is easily peeled off the film, but be careful not to confuse the film with the backing paper. Photographers have been known to develop the backing paper while leaving the film itself on the darkroom floor. Development times for roll films may be different to those for 35 mm films of the same type, so check the manufacturer's instructions. But in most respects processing is the same for both sizes of film.

Making prints from roll film requires an enlarger capable of taking the larger format. As well as a 50 mm lens for 35 mm negatives, you will need a 75 mm lens for roll film negatives. You can use a 75 mm lens to enlarge 35 mm negatives, but this restricts the maximum size of enlargement possible.

Although reasonably compact, the TLR uses 120 roll film providing negatives large enough for high quality enlargements. Indeed, such film produces

Photographs: Clive Helm



Square format The size of pictures produced by TLRs allows plenty of leeway for cropping. The same negative can be used for both horizontal and vertical prints

35 mm With smaller size film, you should try to compose your pictures to fill the frame as much as possible. If you make a vertical print from a horizontal negative or slide, you are sure to lose image quality. But even when the subject is properly placed in the frame, the image may still not be as large as that on the bigger roll film used by TLRs



negatives almost 6 × 6 cm—over three-and-a-half-times the size of negatives produced on 35 mm film—and on anything but the very biggest enlargements grain pattern is virtually invisible. So for subjects where there is plenty of time available and accurate recording of fine detail is essential for big enlargements, the TLR's extra negative size is a considerable advantage. Not surprisingly, it is the format preferred by many photographers of architecture, still life, and other static subjects.

The extra negative size may also make it easier to compose the picture precisely the way you want it. Although the scene in the viewfinder is attractive, you cannot always frame it to give the ideal composition. The negative may be the wrong shape, for instance, or you may not be able to move in on the subject in the way you want. Or there may be insufficient time to compose properly. You may find that when you look at the contact prints you can get a stronger image from a negative by printing just a small section of it. The large negative of 120 film gives you a generous amount of freedom to 'crop' out unwanted areas of the picture without losing quality in the final print.

The square 6 × 6 cm negative is also a slightly more manageable shape to crop. If you like to print your pictures on to sheets of 20 × 25 cm paper so that they fill the entire sheet with no white margins, you will need to crop proportionally more from a 6 × 6 cm negative than from a 35 mm negative. But you will still be left with 25 sq cm of usable negative, as opposed to only a little more than 7 sq cm with 35 mm film.

Because the 6 × 6 cm TLR format makes cropping easy, many photographers find that they can experiment more with these cameras, knowing that they can always re-compose the picture at the printing stage.

The viewfinder

The viewing screen on the TLR is the same size as the negative, so what you see through the viewfinder is almost identical to the final negative. The screen is made of ground glass, which many photographers think is unsurpassed for an easily readable image. Since there is no aperture control diaphragm on the viewing lens, there is nothing to restrict the amount of light reaching the focusing screen. The viewfinder image stays bright, no matter how far the 'taking' lens is stopped down and remains continuously visible, even during exposure, eliminating 'mirror blackout'. You can see the image clearly at all times and make composition corrections immediately.

Many photographers prefer the look-down viewing system of the TLR because seeing a horizontal image at a distance, rather than vertical close to the eye, makes it easier to appreciate the scene as a two-dimensional picture instead of a three-dimensional landscape. This, coupled with the large, bright viewing screen, promotes careful and accurate composition. Although this

type of viewing system is generally unpopular with photographers taking quick action pictures, the look down viewfinder is superior when it comes to leisurely, deliberate composition in controlled situations when there is plenty of time for the shot.

Whenever you want to take a picture from a low viewpoint, the SLR with its eye-level viewfinder can be awkward. If you want to photograph children, for instance, from their own level or below, or if you want a low angle shot to give a shot of your car a dramatic look, you have to crouch down with the camera. Photographing a backlit flower head 10 cm above the ground with an SLR forces you to lie down to use the viewfinder. The TLR, however, is ideal because you can put the camera right on the ground and still easily see the viewfinder when

Loading a TLR

Left to right Loading film into a TLR is quite unlike loading a 35 mm camera.

1 Place an empty film spool in the take-up spool position. **2** Break the paper seal and place your roll of film in the feed position. Run the paper leader around the camera to the take-up spool and thread into the spool slot. **3** Wind on until the start arrows match the alignment marks in the camera. **4** Close the camera and wind to the first frame



standing upright.

As well as looking down into the viewfinder of the TLR, you can, conversely, hold the camera upside down above your head and still get a clear view of your viewing screen. This is a distinct advantage when shooting your subject in a crowd. What you need in such situations is a vantage point above the activity. With the TLR, you can simply hold the camera up at arm's length and compose accurately to shoot over the heads of the crowd. From above the camera records what you, from eye level, cannot even see. For this reason, photo-journalists often carry a TLR for the wider range of angles of view that they can get. Used in this way, TLR cameras will give good images of busy streets, parades, and shots that otherwise could have been missed.

Similarly, you can face one way and point the camera in an entirely different direction enabling you to snatch a candid shot that might otherwise be lost. While appearing to aim innocently forward, the camera is in fact recording the subject at your side.

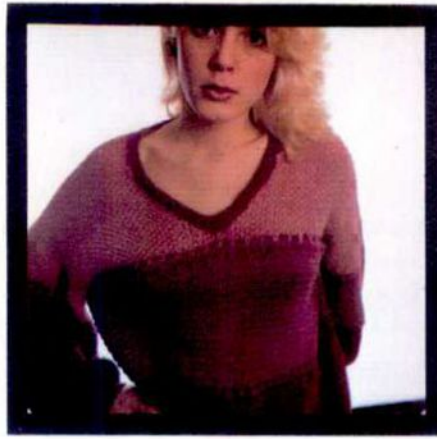
Most types of TLRs also have a simple built-in eye level viewfinder and a few have a pentaprism accessory, allowing eye level operation.

Flash synchronization

Because the shutter of a TLR is built into the lens rather than at the focal plane, you can use electronic flash at all shutter speeds. This can be particularly useful when mixing flash with other types of light, such as daylight. By adjusting the shutter speed to control the effect of daylight and the lens aperture to control the effect of the flash, you can reach a satisfactory balance between the two light sources. This technique is ideal for lighting harsh shadows in sunlight.

The drawbacks

Twin lens reflex cameras are good for general, as well as specific, photography. But they have their limitations. Compared with SLRs, they are bulky and cumbersome, and, unfortunately, on all but one TLR no interchangeable lenses



Parallax error When taking close-ups, make sure you do not cut off part of your subject. Most TLR viewfinders have parallax warning indicators built in

are available. Few TLRs, moreover, have built-in exposure meters, so you have to use a hand-held meter—though many photographers prefer these.

Another disadvantage that TLR users must adjust to is image reversal on the viewing screen. The image that is projected on to the viewing screen is reversed from right to left, same way up, that is, laterally reversed. Although this does not affect composition, it takes some getting used to particularly when panning. When you start to follow a moving car in the viewfinder, it is quite easy to start panning in the wrong direction.

The principal problem encountered with using a TLR camera however, is *parallax error*. Because the viewing and picture taking lenses on the TLR are 3-4 cms apart the image you see in the viewfinder is very slightly different from that recorded on film.

At normal distances, the difference in viewpoint between the taking lens and the viewing lens is unimportant. For pictures closer than three metres, however, you must take parallax into account and correct accordingly. In some models there is a red warning line at the bottom of the viewing screen which gives warning of this.

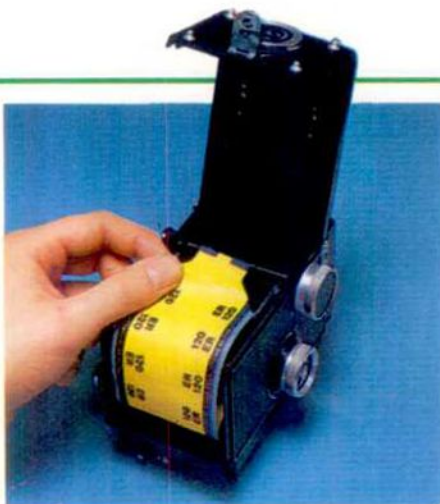
The most convenient way to correct parallax error is to use a pair of supplementary lenses that automatically correct for close-ups. A prism and the upper supplementary lens angles the viewing lens slightly downward, changing the perspective of the camera's viewing system so that the area covered by the two lenses is nearly the same. Different manufacturers produce their own versions of these devices. For example, close-up lenses for the Rollei TLRs are known as Roleinars and the parallax prism as a Rolleipar. For perfect correction of parallax errors, special stands are available with sliding centre columns that move the taking lens into the position previously occupied by the viewing lens. But only SLR cameras completely avoid parallax problems without additional accessories.

A camera for the craftsman

With its versatile viewfinder and large negative format the TLR camera is desirable when shooting anything that requires very high technical quality and where speed of handling is not the most important factor.

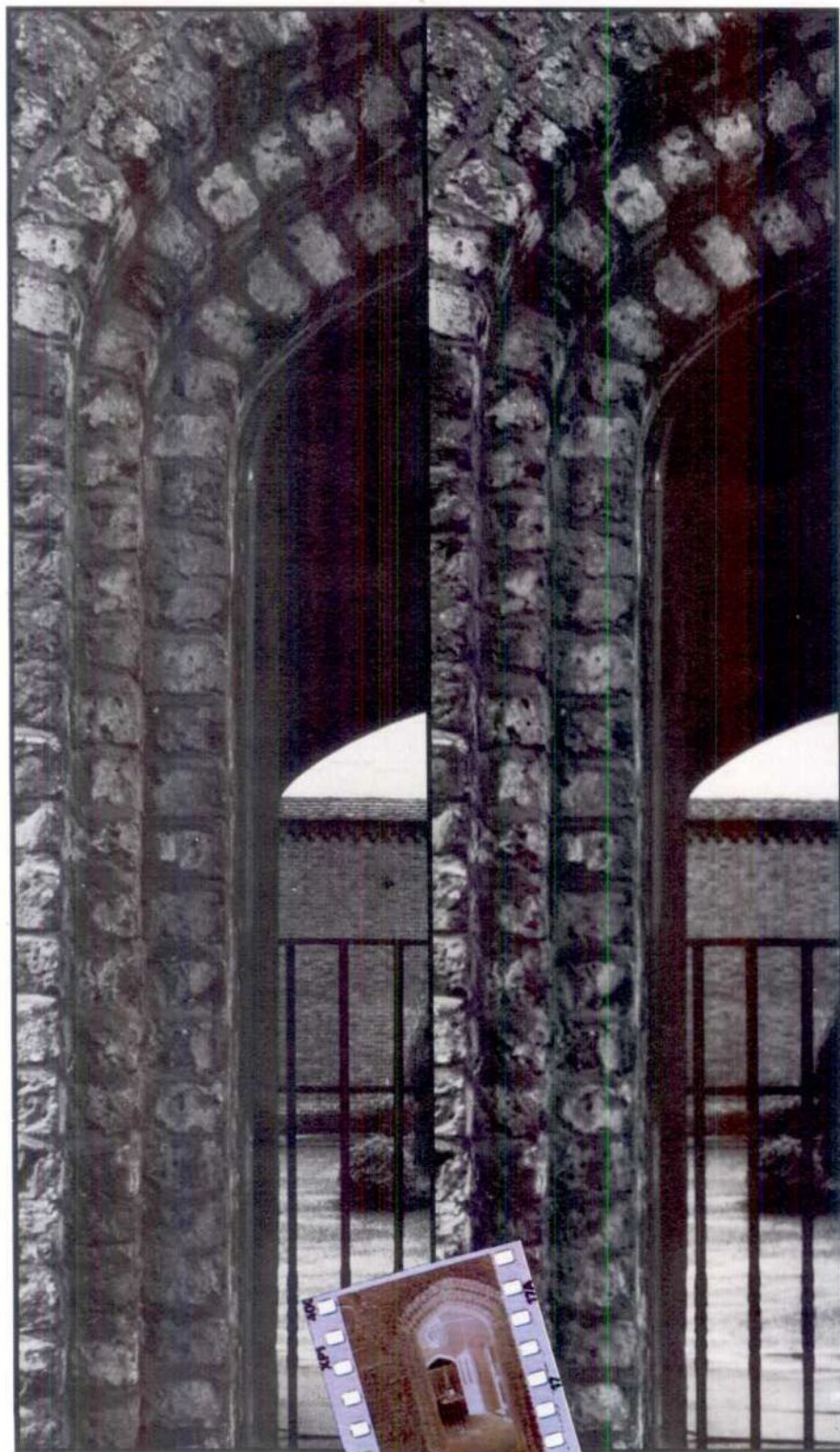
Sometimes the choice of camera depends upon your own working style. If you like to put great care into your compositions and desire precision or beauty of colour and tone, the TLR is ideal. But generally it is not considered to be a fast action camera, though it is good for certain candid shots. The TLR requires an extra degree of thought for the composition before the picture is taken. Although some models can be adapted to take 35 mm film, the roll film that is used with a TLR has only 12 or 24 exposures on it. This tends to make you stop and think whether or not you really want to take the picture, or if the picture is just what you want it to be. Consequently, the TLR promotes a strong visual and technical discipline, which, though it might seem a drawback to the shutter-happy sharpshooter, can be the making of a great photographer.

In many respects, the TLR is particularly useful to have as a 'second' camera and can be used for those occasional shots which demand a high image quality of the sort that a 35 mm cannot match.



Using chromogenic film

The new technology black and white emulsions are based on familiar colour negative types. Processing them is therefore similar to processing colour negatives—but in spite of the high temperatures involved, the work should not present any serious difficulties to the beginner



Traditionally, fast black and white films have produced very grainy negatives, particularly when 'pushed' during development. Traditionally, also, black and white films have tolerated little inaccuracy in exposure on the same roll of film if negatives are to have maximum sharpness and freedom from grain. However, a special type of monochrome film—*chromogenic film*—is available which seems to provide a solution to both these problems.

Some photographers may be put off using chromogenic films because processing is not as simple as with conventional black and white films. Chromogenic films are based on colour negative emulsion technology and are processed in much the same way. Comparatively high processing temperatures are required and these must be very accurately controlled. Nevertheless, the processing is quite straightforward.

Dye image

The emulsion of chromogenic black and white film is very similar to that of colour negative film. It contains light-sensitive crystals which, as in conventional monochrome film, react on exposure to light in the camera to form a *latent image*. But, unlike conventional film, the final image is not silver, but a dye.

The dye is produced during processing when special chemicals in the emulsion react with the developer. Since the amount of dye produced is in exact proportion to the amount of exposed silver, the density of the dye varies over the surface of the negative in the same pattern as the latent image.

After development, the film is given a bleach-fix bath. During this bath all the silver is removed from the emulsion and the remaining dyes are left to provide the final negative image. Once the film is washed and dried, the negatives are ready for printing.

Processing

Because of the new emulsion structure, chromogenic black and white film cannot be processed in the same chemicals as conventional black and white film.

Film comparison The same subject depicted on conventional Ilford HP5 (left) and chromogenic Ilford XP1. Both films were rated at 400 ASA. The negatives have been enlarged to make the grain structure visible: the original negative is shown in the inset

However, because of their similarity to colour negatives, they may be processed with a system designed for colour films, the Kodak C41 process. However, Ilford recommend a specially designed process for optimum results with their XP1 film. You can process Agfa Vario-XL at home using either the C41 process, or Agfa's equivalent, the Process F kit.

The XP1 process

The XP1 kit contains both developer and bleach-fix. The developer is prepared by mixing chemicals from three separate bottles in a specific order. The empty bottles can then be used to store the stock solution prior to use. Self-adhesive labels are supplied to ensure correct identification of the solution. This stock solution is diluted 1:3 in water immediately before use.

The bleach-fix is made up by mixing a two part solution which, like the developer, can be stored in the empty bottles. The stock solution of bleach-fix is diluted 1:4 in water.

Processing solutions are used at 38°C and it is essential to maintain this temperature accurately throughout the operation if results are to be successful. To achieve accurate temperature control you should place the developing tank and the containers holding the diluted chemicals in a water bath, maintained at 40°C during processing by careful addition of hot water. Prewarm the tank before you load the film to prevent the cold tank from cooling the developer.

Once you have loaded the film into the tank, the dilute developer can be poured in and the clock started. XP1 can be rated over a wide range of speed settings and the developing time mainly depends on what speed you have chosen when exposing the film. Nominally, the film is rated at 400 ASA (ISO) and for this speed the development time is five minutes. However, it can be rated at anything from 50 ASA to 3200 ASA without too severe deterioration and you must vary the development accordingly.

If you rated the film at 800 ASA, for example, then it should be developed for 6½ minutes; for 1600 ASA, 9 minutes is needed.

Sometimes it is not possible to maintain the process at 38°C and if you have to process XP1 at any lower temperatures, your development times must be altered according to a time-temperature curve.

Processing Vario-XL

Like the XP1 process, the solutions for the C41 process (or the equivalent Agfa AP70 process) for developing Agfa Vario-XL must be accurately maintained at 38°C—even a slight variation can alter

Processing kit A low cost kit can be obtained to experiment with XP1 processing. This comes complete with one film. The film can be bought separately if you prefer not to risk your negatives by doing your own high temperature processing

XP1 processing steps



1 Mix up the stock solutions. Then prepare a water bath. If you have a dishwarmer, use this to maintain the high temperature



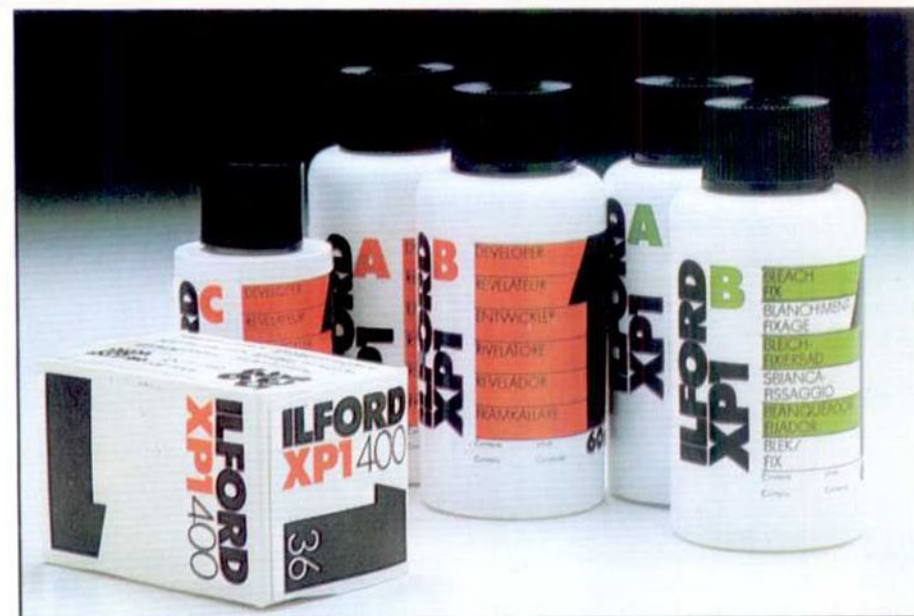
2 Prepare working strength solution from stock solutions with water at about 2°C above the process temperature, and check before use



3 Pour in the developer, noting the start time. To prevent the tank cooling the solution, prewarm the tank using water from the water bath



4 Near the end of the development period—five minutes at 38°C—begin to drain off the used developer and discard it. Check the bleach-fix bath temperature





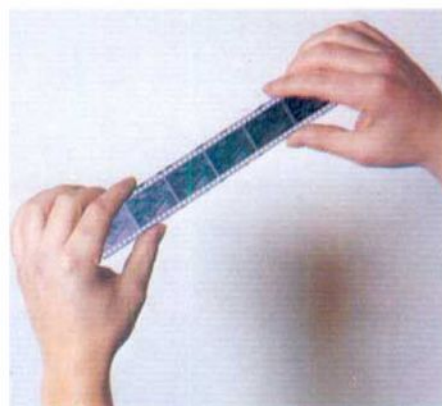
5 A rinse between developer and bleach-fix is not required, so quickly pour in the second solution. Be careful not to splash this and the other solution



6 The bleach-fix period is also five minutes at 38°C. When this has been reached, drain off and discard the used bleach-fix solution



7 Wash water should range between 35 and 40°C, for only 3 minutes if a running supply can be used. Alternatively, use ten bath rinses



8 Processed XP1 negatives appear quite unlike conventional films. Cloudiness apparent after processing disappears when the film has dried

the balance of the dyes within the process. The C41 kit is well known, and easy to use and widely available, but there are alternatives which can work just as well. Some of these even work at a process temperature below 38°C. One of these is Agfa's own Process F kit, which is used at 30°C.

Unlike processing XP1, you do not have to change development time to suit the speed at which the film is used with Vario-XL. Vario-XL can be rated at between 125 and 1600 ASA (and in certain cases up to 3600 ASA), yet development time remains a constant 10 minutes with Process F.

In all instances, take care to maintain the same method of agitation. Ilford recommend the inversion method at the start and subsequently at one minute intervals. Use the same method for processing the Agfa film.

After developing the films, pour in bleach-fix and keep the film immersed, for five minutes in the case of the XP1 process, eleven minutes for the 30°C Agfa Process F. Follow this with a three or four minute wash taking care that the wash water temperature does not defer greatly from the process temperature. You can use the water bath for the job,

but be sure that it is not contaminated by other chemicals. If you use the water bath for rinsing, continuously agitate the film and change the water in the bath completely every half minute. If you use running water, and allow the temperature to drop below about 20°C, increase wash time up to ten minutes.

When the wash is completed, hang up the film to dry somewhere warm and dust-free. If you are used to processing b & w films, you may be surprised to see that these chromogenic versions have a somewhat cloudy or milky appearance at this stage, not unlike a conventional film which has been insufficiently fixed. This cloudiness disappears, however, as the film dries.

Printing the negatives

Chromogenic film negatives have such a wide range of contrast that you may find them rather strange to print from the very first time.

But prints can be made on all the usual materials using your normal enlarger. Unlike developing conventional films, however, it is not necessary to adjust the developing time to modify negative contrast to suit a specific type of enlarger illumination.

The initial problem you may face, however, comes when you try to produce a contact print from the film. The method outlined for conventional films (see pages 250 to 253) may be unsatisfactory because of the wide range of densities, so it is worth producing a test strip. Load your contact proof printer as usual but be careful when deciding which way up to place the negative. It is much more difficult to identify the emulsion side of the chromogenic films because the dullness and curling typical of the emulsion side of conventional films is not so marked. Use the frame edge markings instead.

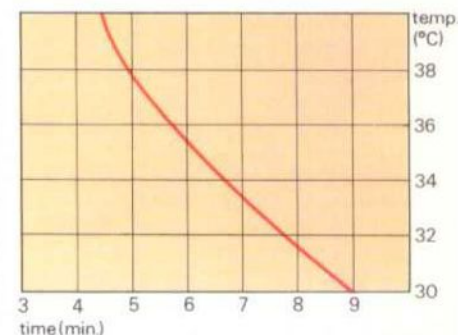
Under safelighting, place a strip of paper against one of the negative strips and close the printer. Shield the sandwich with a piece of opaque card and make a series of test exposures as you would for any test print. Process the print paper as normal, and use the test to determine which exposure time seems best for your particular film.

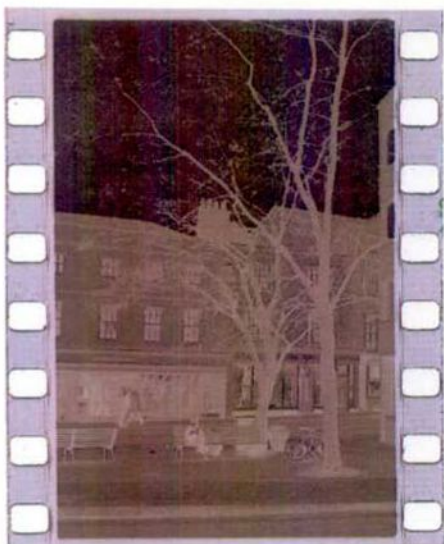
If you stick to the same film speed rating throughout the length of the film—and correctly expose for this particular film speed—many of the individual frames should print evenly. If, however, only a notional film speed setting is used and you have exploited the wide exposure latitude of this film type, it is difficult to get a contact print that shows any more than a scattering of individual frames properly. This indicates that individual test prints have to be made each time you make a print, unless you have an enlarging exposure meter.

Another problem you may experience is that of printing individual negatives which have a very wide contrast range—a picture that includes the light source, for example. The presence of a seemingly printable dye image in reality may mean extremely laborious dodging techniques requiring both very long and very short exposure times for the one print.

Despite these problems, the average chromogenic negative is no more difficult to print than a conventional negative. For the newcomer to b & w photography, and to processing, this type of film offers great tolerance to exposure errors and is obviously attractive because of this.

Time-temperature curve for XP1 if the processing temperature differs from 30°C, read off the new development time from the line on this graph





50 ASA



400 ASA



1600 ASA



Altering speed For this test, XP1 film was exposed at 50, 400 and 1600 ASA and processed accordingly for different development times

The print The 50 ASA film was rather dense but the graininess was fine, while the 1600 ASA film was thinner but still easily printable

Extreme enlargement The reproduction here represents an enlargement of about $\times 20$, and acceptable quality right across the speed range is evident

The Pompidou Centre

The Pompidou Centre is an architectural feature which has become one of the main tourist attractions in Paris. We asked Martyn Adelman to take a series of shots which conveyed its photographic potential



Bus stop When the sun went in Martyn fitted an 81C filter and then photographed this study of symmetry

Ducts and pipes This was the first view Martyn had of the Centre. He used a 200 mm lens to compress the pipes together

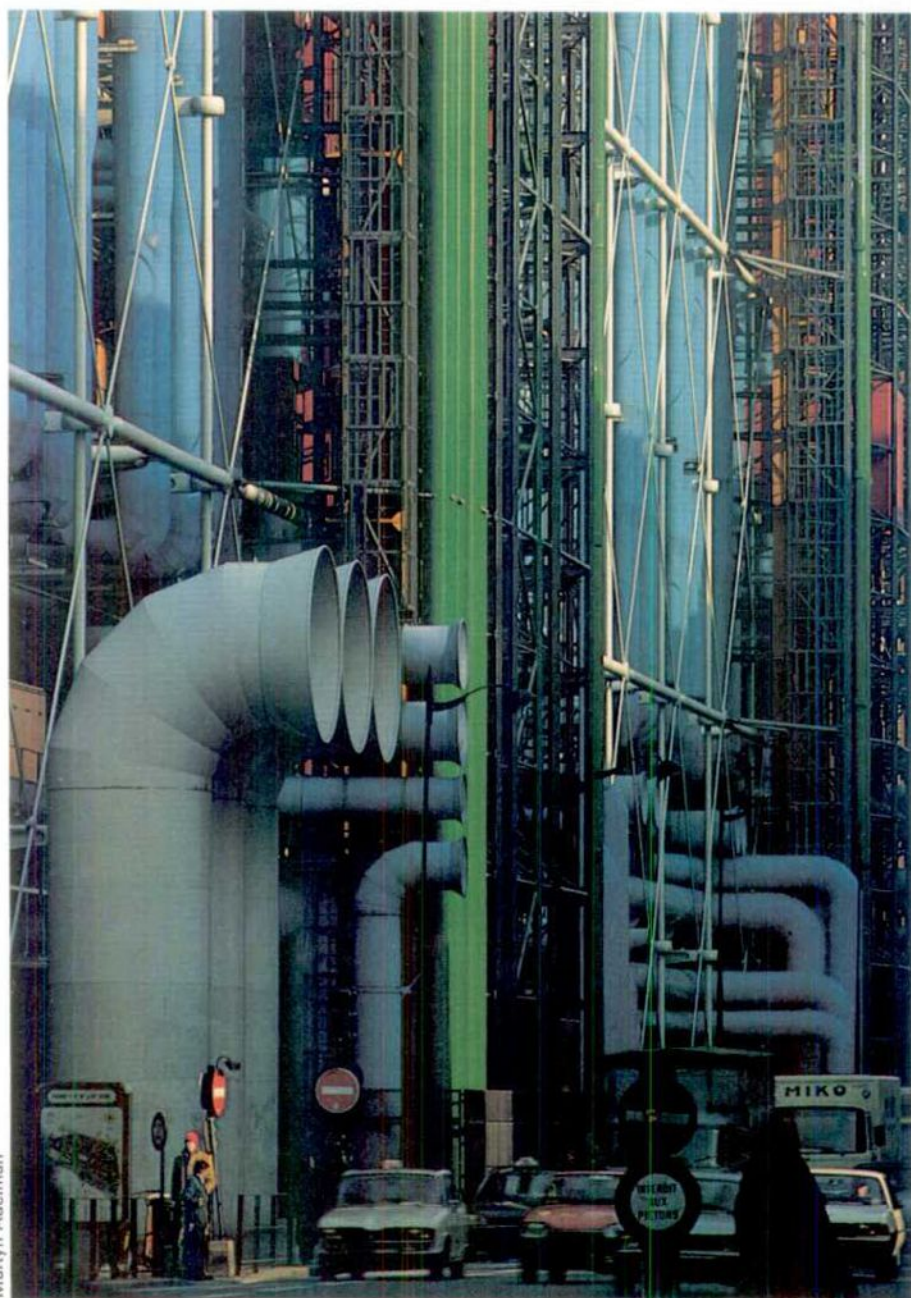
One of the problems facing Martyn Adelman when he visited Paris in February was the poor weather. To do the Pompidou Centre justice he had to use whatever good light there was. This meant getting up early on the first day to make use of the only bright morning of the week.

Armed with two Nikon F2 bodies and 18, 105 and 200 mm lenses, Martyn went straight over to the Centre to start work:

'Usually I walk around and familiarize myself with the place first—perhaps taking along a minimum of equipment. All too often you can get involved with one part so you don't have time for the rest. On this particular day I knew the light would not last so I shot three rolls of Kodachrome while the going was good.'

Martyn chose an unusual selection of lenses. He likes the extreme wide angle effect of the 18 mm, but for isolating interesting details he mainly used the telephotos.

Shots like the candid study of the old man or the man reading a newspaper standing in front of a large mural, were obviously spontaneous 'grab' shots.



Martyn Adelman



Old man To add some human interest, this candid shot was taken with the 18 mm lens already on the camera

Reading the newspaper This medium telephoto shot of a large mural is greatly improved by the man standing in front

Red and blue Throughout the assignment Martyn made an effort to make use of any colour that he could find

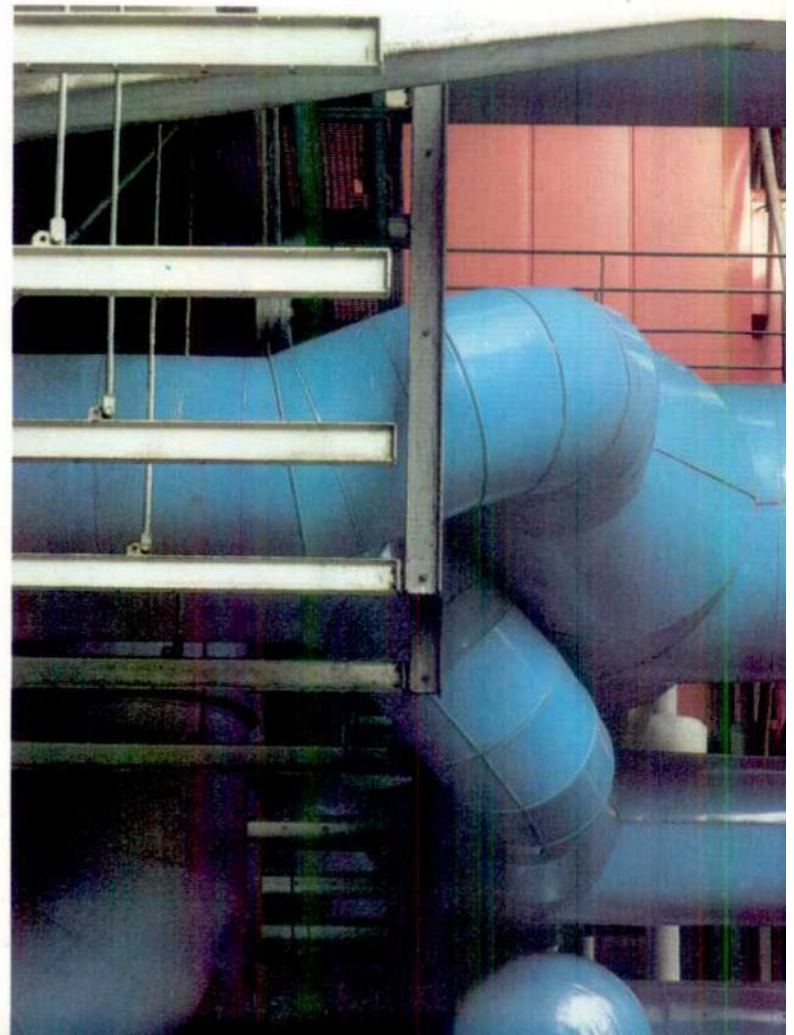
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712 40 89



Assignment

Most of the other exterior shots were done on a tripod—the studies of the large ventilator ducts are examples of this. Martyn described the way he took these, 'The first one was obviously taken from quite a high viewpoint with the 105 mm lens. I had the shot framed, using the tripod, but I waited a couple of minutes for an extra point of interest to move into the bottom of the frame. This turned out to be a dog which just trotted straight across the bottom. The one taken from behind the ducts was done from a very low viewpoint using an

Into the sun To take advantage of this burst of light, Martyn stopped his 18 mm lens down to an aperture of $f/16$

Night time Working out the exposure from experience. Martyn used a setting of $f/5.6$ and kept the shutter open for 3 minutes

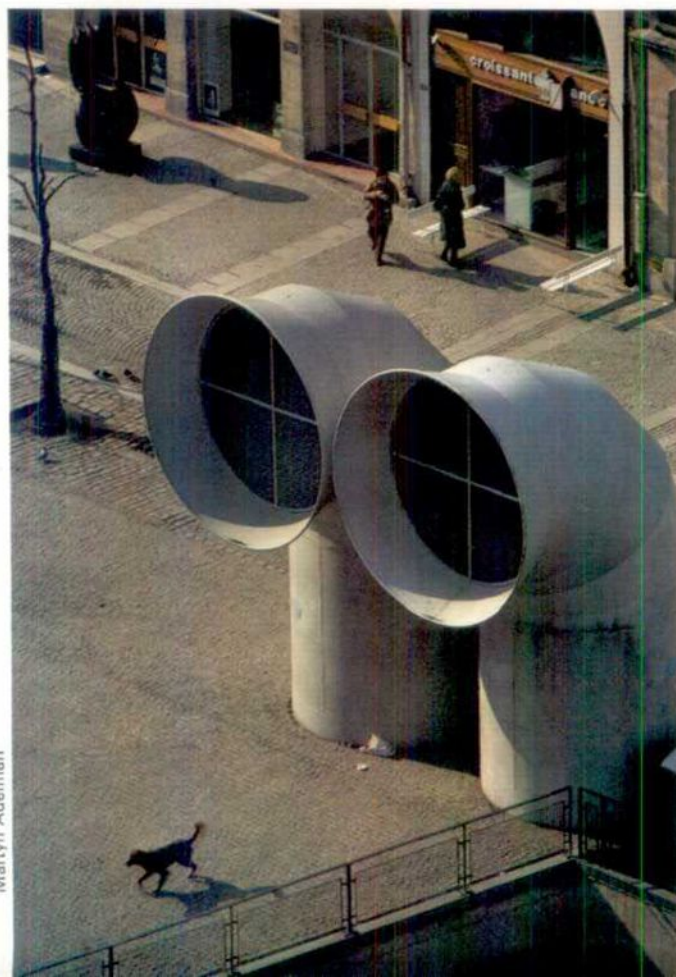


18 mm lens. To make it easier to focus and compose the shot I fitted a waist-level finder. I wanted to catch the sun just peeping past one of the ducts so I stopped the lens down to $f/16$ and adjusted the position of the camera so I could get just a small burst of sunlight.'

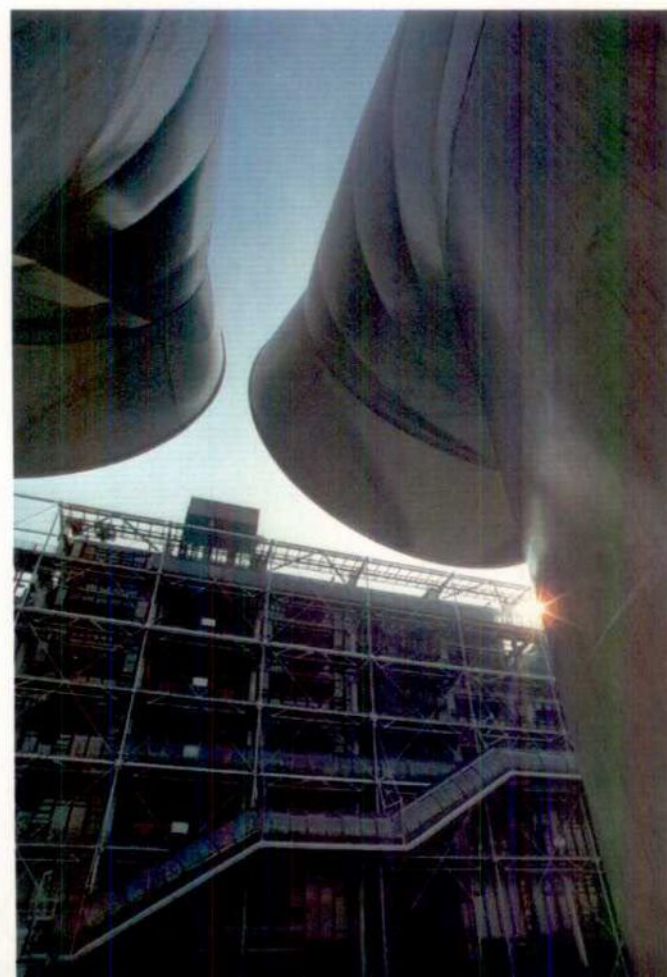
As the sky clouded over and the light changed, Martyn tried fitting an 81C filter to warm up the colours. With the light working against him, he gave up and saved his last shots for a view of the Centre at night. For the shot of the escalator, a very long exposure time was needed. Mounting the camera on a tripod, Martyn guessed the exposure to be about 3 minutes at $f/5.6$.

Ventilation ducts This aerial view makes an interesting shot but Martyn deliberately waited for an extra distraction

From behind The same ducts look very much different from the other direction. A waist-level finder was essential



Martyn Adelman



INDEX

This index covers Volume 1. A full index will follow in Part 98, covering the entire set of *The Photo*. Inside back cover references are given as IBC followed by the part number: e.g. IBC 2.

Accessory shoe
see Flashgun
Action photography 48–53, 85
174–6, 201, 230–2, 272–7, 355–7
Aerial image bench 69
Animal photography 65–70, 242–3,
262, 266, 274, 275, 276, 277
Aperture 38, 46–7, 95
see Depth of field; Shutter speed
Art photography 317–21
ASA (ISO) 38
Astroscope 69
Automatic camera 3
Autowind 213

B setting 8
Backlighting 33, 34–5, 36, 54, 65,
138
Barn door 241
Bayonet mount 213
Black and white film 73, 379–81
Black and white photography 78–9,
102, 105, 125–8, 171
Blurring 4, 5, 6, 8, 12, 31, 39
48–9, 53, 296–7
Bonington, Chris 20–3
Box camera 216–8
Bounce flash 345–9
see also Flashguns; Flash
Bright sun 35
see also Photography against
the light
Burning-in 224

Camera obscura 217
Camera shake 4, 5, 6, 8, 12, 31, 39,
48–9, 53, 296–7
Candid photography 74–9, 104–5
109, 124
Canon AE1 204
Changing bag 27
Chromogenic film 40, 380–1, 394
Claudet, Antoine 215
Close-ups 10, 205–9, 312–6
see Portrait photography;
Telephoto lens; Zoom lens
Colour negative film 71–2, 132–5
see also Film
Colour printing 133
Colour processing 29
see also Colour negative film;
Colour transparencies; Printing;
Processing
Colour temperature 220–1, 258–9
Colour transparencies 72–3
see also Film
Colour values 16, 17, 233–7, 258–9,
261–6, 278–81, 289–93, 341–2
see also Filters
Combination prints 360–3
Compact cameras 3
Composition 14–19, 86–92, 123,
237, 312–6, IBC 11, 326–33,
IBC 12
Contrast 38, 130–1
see also Colour values; Printing;
Processing
Converter
see Teleconverter
Cosmoscope 69

Daguerre, Louis 215, 218, 219
Daguerreotype 215, 218, 219
Davy, Sir Humphrey 215, 216
Depth of field 4, 16, 24, 30–1, 39,
69, 93, 121
see also Composition; Lens
Dark-field illumination 68–9
Darkroom 26–9, 42–5, 80–3
Developing 27, 29, 42–4, IBC 4,
267–9, 322–5
see also Processing
Diffuser 229
Dodging 222–4, 361–2
Drying 322–5
Dust spots 310–11
Dye image 394

Early development of photography
215–9
Electron microscope 350–4
Emulsions 38, 40, 41
Enlarger lens 311
Enlarging 29, 142–5, 250–3,
282–5, 309–11
Exposure 3, 4, 33, 37, 38, 46–7,
84–5, 95, 100, 110–11, IBC 4,
137, 143, 159, 164–7, 222–5,
256, 267–9, 342
Exposure errors IBC 8

F-numbers 46–7, 366
Fashion photography 244–9
Film 40, 71–3, 132–5, 160–3, 220–1,
277, 378–81
see also Film contrast; Film
speed; Lith film
Film contrast 38, 130–1
Film speed 37–41, 131, 140
Filters 15, 22, 55, 57, 94, 95, 96, 97,
221, 241, 260, 278–81, 284,
297, 340–4
see also Colour values
Fisheye lens 121, 338–9
see also Wide angle lens
Fixing 27, 42, 82–3
see also Processing
Flare
see Lens flare
Flashguns 98–101, 194–7, 212–3,
226–9, 238, 239, 241, 254–5, 345–9
see also Flash photography
Flash photography 39, 65, 68–9,
70, 98–101, 108, 110–11, 194–7,
226–9, 238–41, 254–5, 345–9
see also Flashguns; Night
photography
Focal plane shutter 84–5
Focus 86–92, 308–9, 338–9
see also Colour values;
Composition; Depth of field;
Lens; Soft focus
Fogging IBC 3, 311
see also Enlarging; Printing;
Processing
Foreshortening 121, 123
Forman, Werner 317–21
Fox Talbot, William Henry 215–19
Freezing
see Action photography; Shutter
speeds
Front lighting 33

Galactoscope 69
Ghost images 33, IBC 3
Glamour photography 54–7, 97, 195
Godwin, Fay 125–9
Grain 40, 41, 378

Herschel, Sir John 217, 218
Highlights 130, 192
Hot shoe
see Flashgun
Hussein, Anwar 301, 303

Incident light meter 365
Indoors 39
see also Backlighting; Flash
photography; Front lighting;
Light; Lighting; Light meter;
Lights; Poor light; Sidelighting;
Toplighting
Instamatic 2
Inverse square law 254–5

Jig
see Printing jig

Landscape photography 125–9,
329–33
Latitude 380
Leaf shutter 84, 110–11
Lens 46, 211, 270–1, 284, 306–7
see also Enlarger lens; Fisheye lens;
Projector lens; Retrofocus lens;
Soft focus; Telephoto; Wide
angle; Zoom
see also SLR; 35 mm
Lens flare 33, IBC 3
Lens hood 294, 297
Light 198–9, 220–1, 237, 238–41,
254–5, 256–60, 261–6, 270–1,
286–8, 289–93, 312–6, 350

see also Bright sun; Colour
values; Indoors; Lighting;
Light meter; Poor light;
Weather conditions
Lighting 5, 228–9, 238–41, 256–60
see Backlighting; Fashion
photography; Flash photography;
Front lighting; Highlights;
Indoors; Light; Light meter;
Lights; Rimlighting; Sidelighting;
Toplighting
Light meter 3, 35–6, 364–5
see also Bright sun; Indoors;
Light; Lighting; Lights; Night
photography; Poor light
Lights 238–41, 256–60
see also Backlighting; Front
lighting; Indoors; Light;
Lighting; Light meter; Rim-
lighting; Sidelighting;
Toplighting
Lith film 131
Loading the camera IBC 1
Location photography 317–21

Macrofocus 10
Macrozoom
see Zoom lens
Magnum Photos 112–17
Masking 224, 225
Matched multipliers 369
Micro zoom
see Zoom lens
Mirror lock 213
Models 177–8
Monochrome
see Black and white
Motor drive 213
Motor winder 213

Nature photography 261–6
see also Animal photography;
Landscape photography
Negative sandwich 360–3
Niepce, Nicéphore 215
Night photography 6–7, 8, 33, 34,
35, 36, 37, 136–41, 254–5
see also Flash photography;
Light; Lighting; Light meter;
Nikon FE 200–1
Nude photography 177–181
see also Glamour photography

Olympus OM1 202, 203
110 Cameras 2
Operation Drake 272–7
Orthochromatic film 378
Overexposure IBC 7, 267–9

Pan and tilt attachment 8
Panchromatic film 378
Panning 6, 8, 24
Perspective 306–7
Photography against the light
32–6, 223
see also Bright sun
Photojournalism 112–7, 127
Poor light 5, 12, 37, 104–9, 146–8,
156, 220–1, 286–8, 293
see also Flash photography;
Indoor photography; Indoors;
Lighting; Shutter speed; Supports
Portrait photography 168–73, 357
see also Vignetting; Close ups
Preview screen 337
Printing 133, 143–5, 164–7, 184–7,
308–11, 322–25
see also Combination prints;
Printing papers; Proofing
Printing papers 184–7
Processing 29, 45, 80–3, 118–20,
IBC 4, 133, 144–5, 250–3,
267–9, 322–5
see also Colour temperature;
Developing; Enlarging; Exposure;
Fixing; Printing; Proofing
Projectors 334–7
Projector lens 336
Proofing 250–3
Push-processing 379

Quick focus 3
see also Focus

Rangefinder 89

Reflections 209, 312, 316
Reflectors 240
Reinhard, Hans 373–7
Retrofocus lens 307
Rimlighting 33
see also Light; Lighting; Lights

Sailing photography 188–193
Scanning electron microscope
(SEM) 351–3
see Electron microscopes
Self timer 213–4
Shading
see Burning-in; Dodging; Film
contrast; Printing; Vignetting
Shutter
see Aperture; Focal plane shutter;
Leaf shutter; Shutter Speed; SLR
Shutter speed 4–8, 84–5, 137, 196
Sidelighting 179, 181, 227
see also Light; Lighting; Lights
Silhouette 103, 108–9, 112–3,
138, 189
Slide carrier 335
Slide changing 335, 336, 337
Slide magazines 337
SLR 2–3, 84–5, 89, 158–9, 200–4,
210–4
see also 35 mm cameras
Snoot 241
Soft focus 93–7
Special effects 26, 27, 60–1, 65,
104–9, 177, 178, 179, 180, 192,
205–9, 222–5, 226–9, 312–6
Spot meter 365
Space photography 149–53
Stands
see Supports
Sunsets 33–4, 148
see also Photography against
the sun
Superimposition 26
Supports 4, 5, 8, 22, 148, 154–7,
226–8, 239–41, 243
see also Blurring; Pan and tilt
attachment; Shutter speed

Teleconverter 366–9
Tele-extender
see Teleconverter
Telephoto lens 3, 4, 9, 10, 11, 12,
13, 15, 65, 182, 213, 266,
294–7, 300, 307, 328
see also Zoom lens
35 mm cameras 2–3, 4, 9, 12, 21,
37, 84, 85, 126
Tone 38
see also Black and white
photography; Colour values;
Film contrast
Toplighting 227
see also Light; Lighting; Lights
Transmission electron microscope
(TEM) 351, 353–4
see Electron microscopes
Tripod
see Supports
Twin lens reflex cameras 382–4
Twin tube flashgun 349

Ultramicrotome 353
Umbrellas 241
Underexposure IBC 5, IBC 6, 267–9
Underwater photography 273, 275
Unloading the camera IBC 2

Varifocus 10
see Zoom lens
Vario-XL film 395
Viewfinder 2, 10, 14, 212, 383
see also Canon AE1; Olympus
OM1; SLR; 35 mm cameras
Vignetting 11, 63, 124, 225

Weather conditions 21, 22, 37,
104–9, 126–9, 150–1, 231, 384–7
Wedgwood, Thomas 215, 216
Wide angle lens 3, 4, 5, 10, 58,
121–4, 141, 182, 317, 338–9
see also Fisheye; Zoom lens

XPI processing 395
X-ray photography 350

Zoom lens 9–13, 60–4, 294–7